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Rock Products

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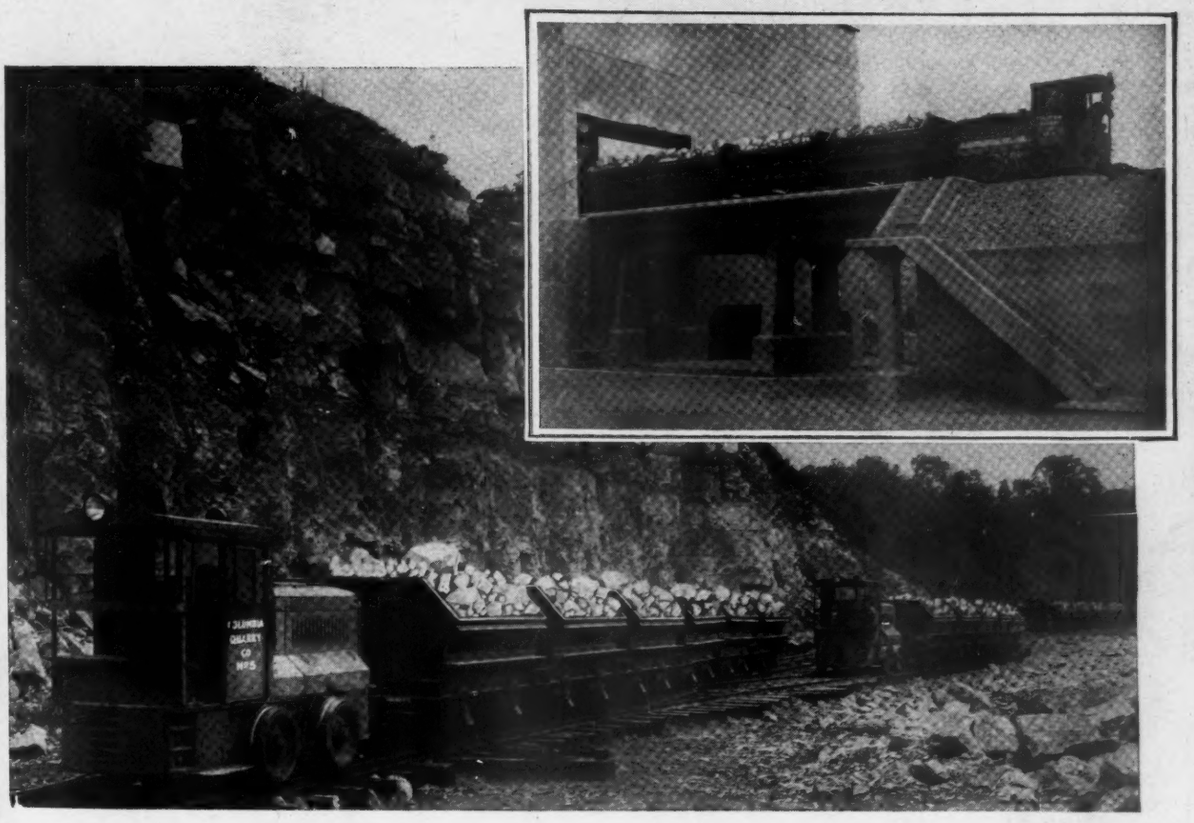

What Some of the Crushed Stone Association Members Saw

A party of prominent members of the National Crushed Stone Association recently made a trip over to see the new plant of the Columbia Quarry Co., at Krause, Ill.

They saw a mighty smooth-running plant, of all steel-concrete construction, with a number of new features that mark a distinct advance in the art of crushing, screening and handling stone. And they saw the part that Plymouth Gasoline Locomotives play in making the plant top-notch efficient.

Five Plymouths are used at this plant with more to follow.

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Volume XXIX Chicago, May 15, 1926 Number 10

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The ELIOT Plant

of the Coast Rock and Gravel Co.

San Francisco, Has a 4 yd. Cableway Dragline and Other Equipment Unusual in the Sand and Gravel Industry, as Told in the Succeeding Pages

Gravel Plant With a 4-Yard Dragline

Coast Rock and Gravel Company of San Francisco Has Developed New Excavating and Washing Equipment

THE Coast Rock and Gravel Co. of San Francisco, Calif., operates a number of plants in California. One of them is at Eliot, a small station near the town of Pleasanton, about 40 miles from San Francisco. This is one of the newer plants which the company has built and it is of interest as a whole because of the unusual equipment that is employed both in excavating the bank material and washing it to commercial sand and gravel.

The plant began operations in 1924. A part of this equipment is a slackline cableway with a 4-yd. bucket. This is probably the largest installation of the kind which is in use, although installations with 3½-yd. buckets of another type have been made on the Atlantic coast. The Coast Rock and Gravel Co. at one time had a slackline cableway with a 5-yd. bucket in service, but afterward discontinued its use. This, and the 4-yd. installation at the Eliot plant, were designed by A. D. Hadsel, who is the operating manager of the company. Cableways of Mr. Hadsel's design are used in a number of plants on the Pacific coast and elsewhere.

The 4-yd. cableway differs in many details from the cableways so much in use in the middle-western and eastern states, although the operating principle is the same. Some of the important differences are: The use of a double cable for the slackline, the use of two hoists in the place of one double drum hoist and the use of a rotating hoist house set on top of a tower in place of the usual mast and stationary hoist house.

The double slackline, which the operators here always refer to as the "skyline," is a 1⅝ in. steel rope which passes over an equalizing block fastened to a deadman at the end of the span. Thus both ropes (or both parts of the doubled rope) are kept under an equal tension. The doubled rope is used just the same as the single rope is used in other systems, but of course the trolleys of the bucket which run on the cable have to be provided with two rollers in the place of the one used with other systems.

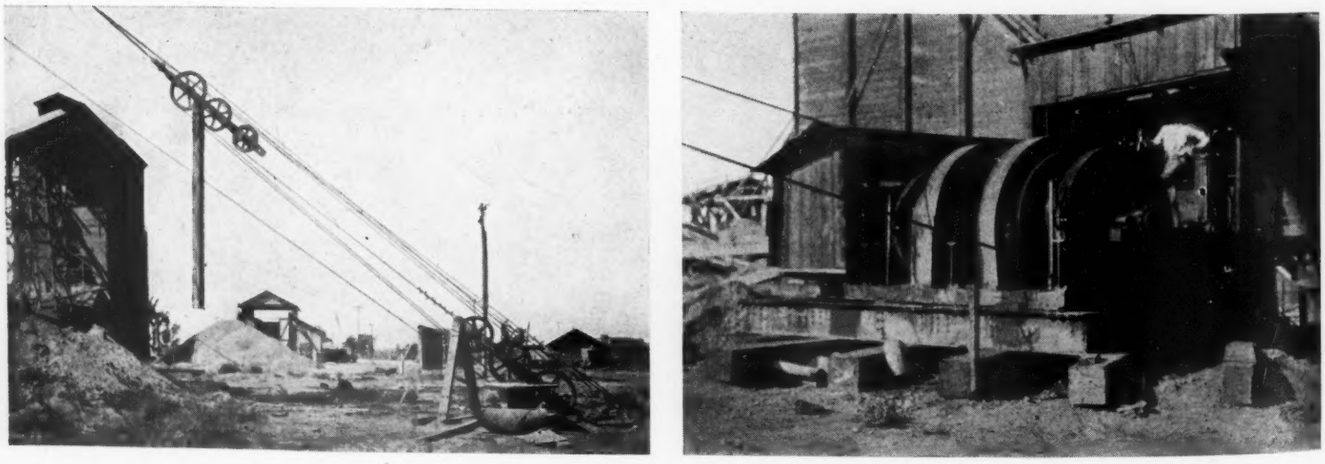
The doubled rope is attached to a system of sheaves, three fixed and three movable, the effect of which is to make a triple block. The 1-in. tension rope of the system is reeved through these sheaves and brought to an independent hoist.

The tower with the revolving hoist house and the long receiving bin

The traveling rope, by which the bucket is pulled through the ground in digging and afterwards drawn up to the bin, is a 1¼ in. cable. This is attached to a chain-bridle on the front of the bucket and it also passes through a block on the rear trolley. So long as the bucket is free to move, the pull is on the chain and the bucket is drawn up the line. At the end of the run, above the bin, the front trolley strikes a block which is fastened to the "skyline." The pull then causes the rear trolley to move forward, which makes the rear end of the bucket lift, and so the bucket discharges itself into the bin. In moving forward the rear trolley rolls on a short section of I-beam which is attached to the front trolley.

The bin into which the bucket discharges is 50 ft. long and 18 ft. wide. The length is at right angles to the bucket travel, and this length is extended by wings on the ends. This allows the bucket to be worked through an angle of approximately 120 deg.

To change the direction of the path of the bucket the hoist house is rotated, carrying with it the hoists and a double head sheave over which the double "skyline" passes. The hoist house is about 30 ft. square and is framed of 12x12 in. timbers. Rolled steel tracks are fastened to the underside of the hoist house frame and to the top of the tower frame. Between these operates a built-up anti-friction bearing 24 ft. in diameter, consisting of 50 4-in. flanged steel rollers. The whole constitutes a turntable on which the hoist house revolves.



Left—Sheaves which make a triple block for the tension line. Right—The hoist for operating the scraper bucket

End view of the plant showing the office building and machine shop

The supporting tower is strongly built of 12x12 in. timbers well braced. But it will be noted that the tower does not have to resist the side pull of the ropes while the bucket is being raised by tightening the slackline. This strain is passed on to the deadman at the other side of the tower to which the fixed sheaves of the tension system are attached.

A 300-h.p. "Golden State" hoist pulls the traveling cable and a 150-h.p. hoist of the same type pulls the tension cable. Both were made to Mr. Hadsel's design by the Miners Iron Works of San Francisco.

There is some vibration in the hoist house when the bucket is being raised and lowered, but it is not so much as one would thing there would be when the weight of the bucket and its contents is taken into consideration.

The total span, from the tower to the deadman beyond the digging point to which the "skyline" is fastened, is about 1300 ft. At the time the pictures were taken the digging point was about 800 ft. from the tower. At this distance a round trip was being made every two minutes, which gives the system a capacity of 120 yd. per hour. But the actual production of the plant is 1600 tons per 10-hour day, so it is evident that the real capacity of the bucket is considerably in excess of the 4-yd. rating.

The digging is hard. The gravel is compacted so that it stands up like a wall on the sides of the bucket path. It is not actually cemented, for it disintegrates in the washing plant easily enough, but it is so tight that it will not flow into the bucket path when the cut is made. For this reason a scraper bucket is at times used as a helper. It draws the material to a point where the 4-yd. bucket can reach it easily.

This scraper bucket is of 5-yd. capacity and is of the open bottom type. It is pulled in by a 200 hp. hoist made by the United Iron Works. The ropes before going to the hoist pass through sheaves hung in a framed tower about 24 ft. elevation to prevent the ropes from dragging on the ground.

Ordinarily the winter rains cause sufficient run-off in the creek bed in which the deposit is located, so that the consequent floods entirely replenish the excavation of the preceding year. Such a replenishment has just taken place during the recent winter rains, therefore the scraper rig has been discontinued and its use will not be required this year.

From the receiving bin the material is fed to the washing plant through a segmental type gate which has a 24x36-in. opening. Water is added at this point. This water comes from the sizing screens above the bins where it has been once used to give a final rinsing to the gravel. It contains so little clay that it may be used for the first wash and using it in this way saves a considerable expense for pumping.

The material and water goes to a cylindrical screen 32 ft. long. This has sections with ⅜-in., ¾-in. and 2-in. holes, but the only purpose of these is to spread the material along the screen for all the undersize goes to the same place, into the reciprocating washer below the screen. The oversize of this screen goes to two No. 6 "N" Allis-Chalmers gyratory crushers.

The reciprocating washer, which is another of Mr. Hadsel's inventions, has a heavy steel frame with paddles that move back and forth and up and down so as to drag the material through the water. It somewhat resembles a Dorr classifier in its action. There is an overflow of fine sand and clay which is sent to waste. The remainder, which is a mixture of sand and gravel of commercial sizes is discharged in a dewatered state from the end of the washer. This joins the crushed oversize, the discharge of the two No. 6 crushers, on a 30-in. conveyor belt of 400 ft. centers, by which it goes to the screening plant.

The washing and screening equipment which has just been described is placed in the base of the tower that supports the hoists for the dragline. The screening equipment is placed above the bins some distance away. The belt lifts the material about 60 ft. in taking it to the screens.

These screens are of the reciprocating type and are of Mr. Hadsel's design. The screen surface is 20 ft. long and 5 ft. wide set at a slope of about 10 deg. Each screen is hung by four 1x8 in. pieces of hardwood which spring back and forth as the screen is reciprocated. The motion comes from four eccentrics which are connected to the screens by long wooden pitmans, and the eccentrics are set so that a forward shake

The dug-over area shows how the gravel stands up between the paths of the bucket

on one screen is in time with a backward shake on the screen below it. This has a balancing effect that keeps down the vibration. In fact very little vibration can be felt on the floors or walls of the building. The screens make about 160 strokes per minute and the length of stroke is about 10-in. The effect is to urge the gravel rapidly along the screen as well as to keep the screen from blinding.

Heavy water sprays are used on these screens and this is the water spoken of as being used for the first washing of the material.

The oversize of the screen is above 2-in. and it is sent by a chute to a pair of 18x36-in. Allis-Chalmers rolls. After passing these it goes to a conveyor which lifts it to the main conveyor which returns it to the shaking screens. All the other products of the shaking screens go to the storage bins below except that of the finest screen which is a mixture of pea gravel and sand. This is sent to a Hum-mer screen which removes the pea gravel which is sent to a bin to be sold for road dressing. The sand with the water goes to two sand wheels.

The scraper bucket which is sometimes used as an auxiliary

These sand wheels are each about 8 ft. in diameter. The outer rim is a pair of steel rods from which are hung scoops or buckets that pick up the sand as they revolve. The wheels are set in a box so that the lower half is submerged. The current of water which carries the sand flows through the box to an overflow over which it passes carrying the clay and unwanted fine sand This overflow is sent to waste. The sand raised by the buckets falls into a chute with a steep incline and thence goes to a bin. It is quite well dewatered by being drained as the buckets lift it to the chute.

In loading out the contents of the bins chutes lead to a belt conveyor which runs the length of the bin and segmental-type gates permit the bins to be drawn so that either a single product or a mixture may be loaded. This conveyor rises to a swinging chute which goes back and forth while the conveyor is running, spreading the material the width of the car.

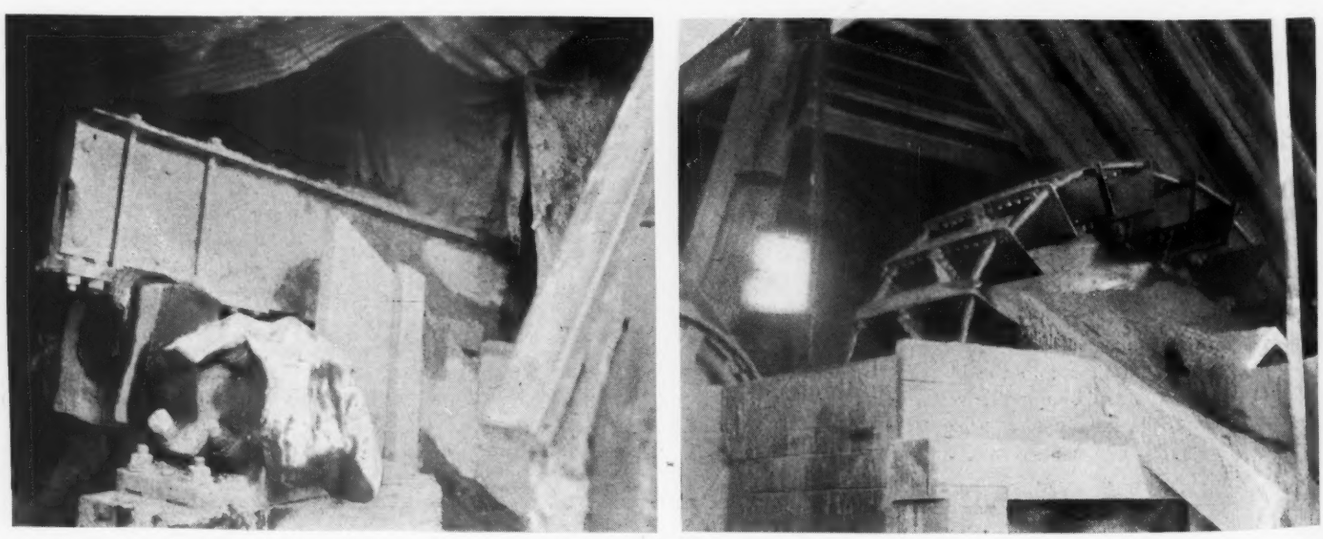
The plant has its own locomotive, a 45-ton American, for shifting cars and for taking them to a stockpile. For loading in and out of the stockpiles two Brownhoist locomotive cranes are kept in service, each of which has a 1½-yd. clamshell bucket of the same make.

The water used is 1100 g.p.m. and this is furnished by a 10-in. Byron Jackson centrifugal water pump. This draws water from a well which is about a half-mile from the plant.

This Eliot plant is one of seven plants operated by the Coast Rock and Gravel Co. F. N. Woods, Jr., is president of the company and F. W. Erlin is vice-president. The offices of the company are in the Call building in San Francisco. L. E. Thomas is manager of the Eliot plant.

Recovery of Lime by the Flotation Process

SERIAL No. 2744 of the Bureau of Mines, Department of Commerce, describes investigations on recovering lime which was combined with iron ore to make the concentrate as nearly self-fluxing as possible. The iron was recovered by a magnetic log washer and the lime by the flotation process which is so much used on copper, lead and other metallic ores. Oleic acid and cresol, both cheap materials, were used as flotation agents. About 1½ lb. per ton of a mixture of these was used. In one test 79.5% of the lime was recovered and 97.7% of the insoluble matter was rejected, leaving a self-fluxing concentrate.



Left—End of the reciprocating washer showing the crank and one channel iron. Right—One of the sand wheels showing the discharge chute

The process would appear to be of negative value to the lime industry since the lime recovered by flotation lessens the market for flux stone by an equal amount. But the recovery method may prove to have value as a separation method in cases where a very pure limestone is wanted for chemical purposes. The possibility of using it in this way would depend upon how closely the lime was combined with the impurities.

Researches in Concrete

"RESEARCHES IN CONCRETE" by W. K. Hatt, which is Bulletin No. 24 of the Engineering Experiment Station, Purdue University, Lafayette, Ind., is a pamphlet of more than unusual interest. It is about as complete a resume of the known facts of concrete, developed by research, as any that has been brought to the notice of this paper. It starts properly with a brief historical review telling what various experimenters and engineers have done.

In the second part the expansion and contraction of concrete are explained and the effects of moisture and heating are charted. The part played by the character of the aggregates, proportioning and the size and shape of the specimen are explained. This is followed with results of research on the elasticity of concrete, its fatigue under strain, its plasticity and related matters.

The permanence of steel in concrete and the results of both tests and experience form interesting sections. The effect of age is shown in charts which compare the results obtained by various authorities. The latter part of the treatise gives the effect of varying amounts of mixing water on the strength and density of the concrete and also the effect of the time of mixing on these characteristics.

This bulletin should certainly be read by everyone who is interested in portland cement concrete, whether he be a designing engineer, a contractor, a manufacturer of concrete materials or only a man who is generally interested in building materials and methods.

Not the least valuable part of this book is an excellent bibliography in which all the important articles which have appeared in technical journals, as well as books, are listed.

Fuels and Their Combustion

A BOOK by Robert T. Haslam, professor of chemical engineering at the Massachusetts Institute of Technology and Robert P. Russell, assistant professor, has been recently published by the McGraw-Hill Book Co., 370 Seventh avenue New York. It contains 810 pages with many diagrams and other illustrations.

This is an exceedingly good book on the properties and use of fuels and well proportioned. The first 136 pages are given up to a description of fuels and their characteristics; the next 125 pages are given to the chemistry of combustion and the chemical calculations pertaining to it; and the remainder is devoted to practice in the use of various fuels.

In the last named section the material is well chosen. While the section is complete the writers have not made the common mistake of including a lot of obsolete devices and methods. Rock products readers will be especially interested in the sections devoted to powdered coal, fuel oil and producer gas. Each of these is adequately handled. The lime kiln has been given especial consideration and several pages of calculations pertaining to lime burning are included.

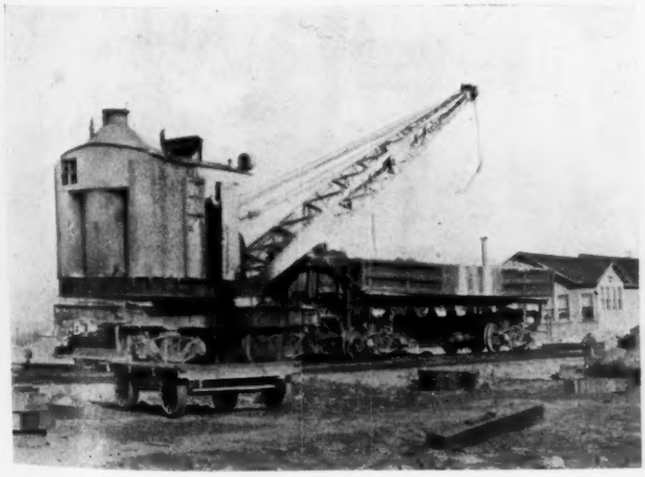
Of course such a book must treat of principles more than particular applications, and this is where its greatest value lies to the reader. It is difficult to make advancements in any industrial line without a knowledge of underlying principles, and it is the reviewer's observation that many men who are employed in those industries in which fuel consumption plays a large part have only a limited knowledge of the theory of combustion. The book ought to be owned by everyone who has charge of kilns, dryers, boilers or other machines which use fuel to any considerable amount.

Frame for holding the cables from the ground

Farmers Lime Kilns Long Ago Abandoned

IN Lehigh county, Pennsylvania, there were at one time many lime kilns run by farmers to produce agricultural lime. The last of these small kilns shut down not long ago, according to a story in the *Allentown, Penn., News.* However, the small kiln production has not amounted to anything in years, as farmers found it cheaper to buy lime than to burn their own.

There is some crushing of limestone by farmers to produce agricultural limestone but this industry in most places has followed the farmers' lime kiln industry. The farmer finds it cheaper to buy than to operate his own crusher.



Left—Locomotive crane for stockpiling. Right—A full sized locomotive is used for handling cars

Many Years' Investment in Developing Magnificent Quarry Face

East St. Louis Stone Company, Illinois, Operation Illustrates Value of Systematic Development in Preparing for Future Large Scale Production

Panorama of the plant of and quarry of the Eas

ONE of the oldest, continuously operated quarries in the St. Louis district is that of the East St. Louis Stone Co., East St. Louis, Ill., on the Mississippi river opposite St. Louis, Mo. For the past 23 years it has been operated under the direction of Ralph E. McLean, and for 30 years prior to that by the firm of Niemes and Riemann, for rubble building stone. Mr. McLean, who began his quarry experience as a bookkeeper for the original firm, is now the sole owner of the enterprise.

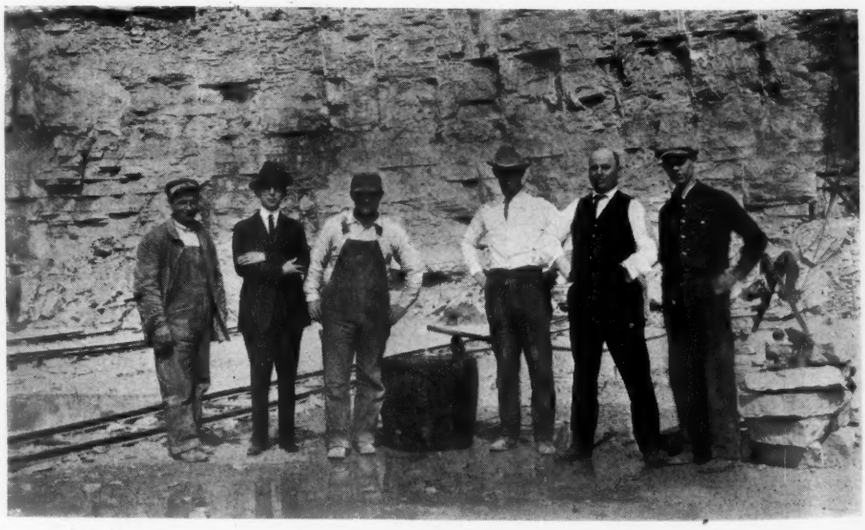
Since Mr. McLean has owned the business he has had but one object in view—to develop a quarry face and a crushed stone business which would justify a large, modern plant. He has untold faith in the future of the quarry business, as is witnessed by what he has accomplished with no other resources than what he has gained through the sale of the output of this quarry. He says, frankly, that he has made little more than a living out of his operation, but a single glance at his quarry by one familiar with quarry operations shows that he has actually invested thousands of dollars in as near an ideal quarry working face as one ordinarily ever witnesses.

Here we have an example of the logical development of a quarry enterprise—the physical development of the quarry, so that it may be made to produce the desired quantity of stone economically, and the growth of the business to justify a large operation. It must be confessed that many quarry operations have developed under the exact opposite of conditions—a big plant, little business and an undeveloped quarry face.

Until recently the quarry was operated in benches, using 3⅛ and 3¼-in. drills mounted on tripods. This season the tripod drills have been abandoned and the first well drill installed—a 5⅝-in. Sanderson-Cyclone driven by a gasoline engine.

The stone lies in almost perfectly horizontal strata with 20 to 40 ft. of overburden. The overburden is removed by steam shovel and a train of 2-yd., V-bottom, side-dump cars, hauled by a Whitcomb gasoline locomotive. The height of the quarry face, to the present working level, is from 80 to 85 ft. The face is in the form of a semicircle (or oval) approximately 550 ft. in diameter and with a 350 ft. ordinate (depth from ends of face at center).

The crushing plant is located near the center of the face and on a branch line of the Terminal R. R. of St. Louis (belt line).



Left to right—W. LaPere, master mechanic; W. J. Cavanaugh, engineer, Kennedy-Van Saun Mfg. and Engineering Co.; A. Bilzing, foreman; A. C. Dood, superintendent; R. E. McLean, president and general manager and M. E. McLean, clerk

Hand-loading, on day work system, is employed in handling the stone. A fan-shaped track system extends from a revolving derrick to various points at the quarry face. The loaded cars are brought to the derrick by horses, or mules. The cars are skips resting on 4-wheel trucks and hold 4000 lb. of stone each.

The derrick is controlled by a multiple-drum steam hoist and, by means of a three-chain sling, lifts the stone skips from the trucks, swings them through an arc of something over 90 deg. and dumps the skips in the initial No. 6 Gates gyrating crusher. The chain on the dumping end of the skip is equipped with a special self-releasing hook, so that in dumping the skip it is only necessary to rest it on the rock pile over the crusher for a moment.

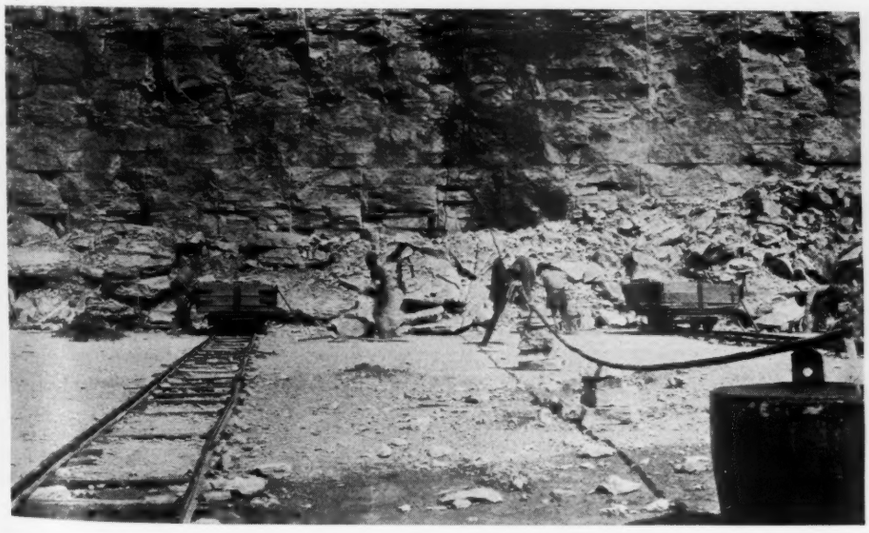
The crushing plant is simple, consisting of the No. 6 Gates gyratory, with a belt-bucket elevator to remove the stone and elevate it to the top of the plant, where it passes through a 4x16-ft. revolving screen with a 3/16-in. wire-screen dust jacket for a part of its length. Everything over 2-in. is rejected and is sent by a gravity chute to a No. 37 Kennedy gearless reduction crusher, mounted alongside the elevator. This crusher has its drive motor on the eccentric shaft, below the crusher. The output of this crusher returns to the foot of the same elevator serving the primary crusher.

The plant is very compact and probably has a minimum of equipment. Its output runs from 400 to 500 tons per day, and is remarkably clean, owing, doubtless, to the cleanliness of the quarry operation.

Ralph E. McLean takes great pride in his operation, and in the splendid results obtained in his systematic development of the quarry. He foresees a large modern system for quarry men and laborers which provides 30 cents per 10-hr. day extra for operation with a model village for employees, in the meadow lands in front of his quarry, and which are a part of his property. He has dreams of profit-sharing and of making his employes real partners in his enterprise.

At present he is operating under a bonus every employe who stays on the job until November 30. This, of course, will not accrue to any who may be "fired" for cause, but in case a man quitting through no fault of his own, he will receive whatever bonus is due him for the time actually employed.

St. Louis Stone Co., East St. Louis, Ill. The city of St. Louis, Mo., is on the opposite side of the Mississippi river, directly over the plant. The view, of course, shows only half of the arc of the quarry face

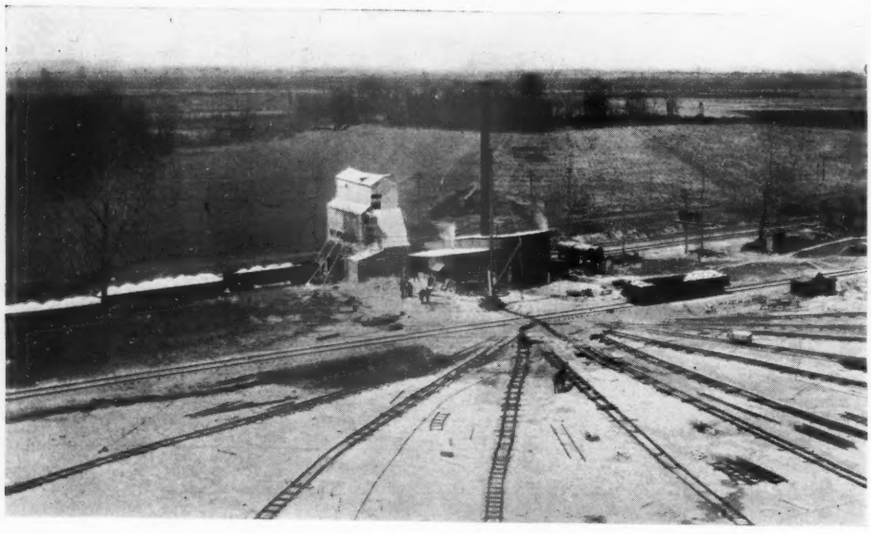


Loading cars at the quarry face. The cars are loaded by hand and then brought to a derrick which dumps them to the crusher

New well drill which has replaced the tripod drills used for many years

Associated with his father—learning the business from the ground up—is Morris E. McLean. A. C. Dodd is superintendent and W. LePere master mechanic.

Fan-shaped track system leading to the face of the quarry at the East St. Louis Stone Co.



Diverging track system leading to the crushing plant of the East St. Louis Stone Co.

Derrick used to lift supplies for stripping from the quarry floor. It shows in the top picture on this page

British Crushed-Stone Quarries Must Compete with Imported Stone

ONE would naturally conclude that the crushed-stone and sand and gravel industries are as near impregnable to foreign competition as any industries could be; but it seems that this is not the case in England, where importations of crushed stone for government road building is a serious menace to British quarry owners. The following from *The Contract Journal* (London) is interesting to American readers as showing the effect of foreign competition:

"With competition as keen as it is, the position of the quarry manager is most difficult. This certainly cannot be denied when one reads the facts given by Sir Cooper Rawson, the M. P. for Brighton. Writing from the House of Commons recently to the *Times*, he states that at the present time more than 200,000 tons of granite macadam are imported annually into this country from France and Belgium for use on Britsih roads, while, at the same time, large and important quarries in Scotland, Wales, Westmorland, Devonshire, Leicestershire and the Channel Islands are working short time owing to lack of orders. Most of the foreign roadstone is used in the counties on the south and east coasts, but French and Belgian roadstone, thanks to the depreciated exchange, is now penetrating into the interior, and thus affecting adversely every quarry in the country. Competition from abroad has already reduced the price of British roadstone to such an extent that, unless a quarry is working full time, it does not pay to keep it going; but many quarry owners, rather than shut down and throw their men on the dole, are keeping them on short time in the hope that they may tide them over the present depression. He said: 'The industry is faced with the prospect of the further shutting down of quarries unless it is supported by those whose duty it is to maintain the roads of the country. Were local authorities to insist on the use of only British roadstone for the making of British roads, employment could at once be found for hundreds of trained quarrymen who are at present unemployed. There are special reasons why British roadstone should be used in preference to foreign roadstone.' The British quarrying industry, at the request of the Ministry of Transport itself, has within recent years gone out of its way to install new plants and to extend its operations, because of the steadily increasing demands for British roadstone which our expanding road fund and growing road program seemed to imply. With the prospect of a reduction in the road fund they see much of the money sunk in this new machinery being utterly wasted, unless the probable reduction in the government's road program is balanced by the increased use of British roadstone for the making and maintenance of roads."

Study of Decomposition of Calcium and Magnesium Carbonates and Dolomite

Laboratory Investigations to Determine Data for Practical Application as Well as Scientific Information

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

NOT ALL LIMESTONES behave alike when burned in lime kilns, some decompose at lower temperatures, others require more time and some are overburned easily.

Then, what is the amount of heat necessary, and at what temperature does the decomposition begin? Evidently between the high calcium, magnesian and dolomitic stones there must be a considerable variation.

Again, what effect has steam in the kiln, or other gases in varying proportions upon decomposition of limestone?

To determine answers to these questions by experiments on a lime kiln, with any degree of exactness, is impossible. Recourse must be taken to a laboratory properly equipped to measure with great accuracy all the variables.

Of course, the decomposition temperature of calcium carbonate is known, and that of magnesium carbonate known approximately, but do the large pieces of more or less dense stone in a lime kiln behave the same as the finely pulverized, and consequently quite porous, specimen which ordinarily is used for decomposition temperature determinations?

In an effort to answer these questions, research work was undertaken, the first part of which is now completed.

Taking Temperatures of Stone

In this case, the samples of stone used were not pulverized. Small samples were cut out and a small hole drilled through the center. Into this hole, a platinum-rhodium thermocouple was inserted and connected to a potentiometer.

Immediately adjacent to the limestone sample, another sample was placed of a kind having about the same conductivity as limestone but which did not decompose within the range of limestone decomposition. This sample was called "Neutral Body" and the limestone sample "Active Body." These two specimens were inserted into an electric combustion furnace through which carbon dioxide (Co_2) gas was passing.

The current was turned on and the temperature of the limestone was taken every two minutes, followed in 30 seconds with the determination of the temperature of the neutral body. These temperatures were plotted, and some of the charts giving the results are herewith enclosed.

Fig. 1 gives a "Transformation Curve" for Peerless White Lime Co. (Hunkins-Willis) high calcium limestone. It will be noted that nothing particular happens until a temperature of 1650 deg. F. is reached, then while the neutral body continues to gain in temperature the active body does so also but much more slowly, the reason being of course that the heat imparted to it is used up to drive off the CO_2, while at 1650 deg. F. the temperature difference between the two bodies was only 9 deg. F., one ascended so slowly due to cooling action of decomposition process that after 20 minutes the temperature difference was 92 deg. F.

Editor's Note

THESE DATA are put forth as preliminary conclusions only, after the use of much persuasion on the part of the editor; for the author is modest of his accomplishments in scientific research.

Incidentally, Mr. Azbe is engaged in a kind of research, so far as we know, almost without a parallel in industry. With no other resources than his own personal ones, and with scant encouragement from sources where his work should find encouragement, he is laboring single-handed to establish fundamental scientific facts upon which the whole science of lime manufacture rests—facts of which he, at least, recognizes the practical significance, and for which he will one day doubtless be accorded the reputation of a pioneer investigator.—The Editor.

Temperature During Decomposition Not Constant

A quite general assumption in the past has been that when a limestone sample acquires the decomposition temperature, this temperature will remain constant until all the CO_2 is driven off, then it begins to rise. Evidently this is not the case. Twenty-two minutes after decomposition began, the undecomposed limestone in the center of the sample was at a temperature of 65 deg. F. higher than the decomposition temperature. How was this possible? The writer knows of one explanation and that is that as the lime film built up in thickness the CO_2 had greater difficulty in escaping, and so pressure was developed.

The lower curve on the chart gives time and temperature difference relation between the "Neutral" and "Active" bodies. The temperature difference between the two increases for 24½ minutes, when the difference is 95 deg. F., then it drops off. A repeated number of tests with this stone gave substantially the same results.

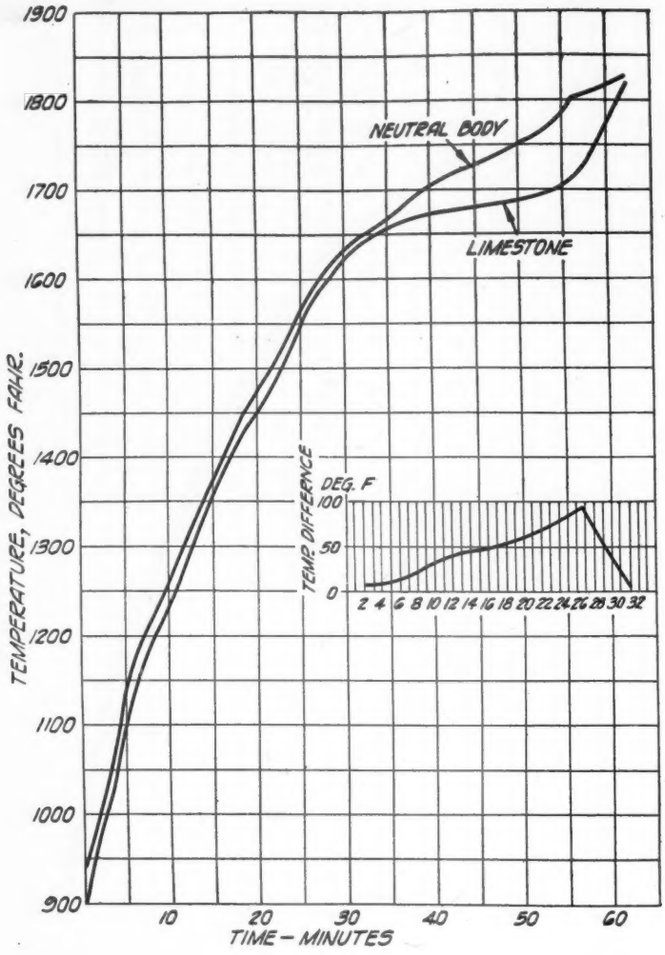
Taking temperature in the center of a sample assures that the entire sample must be at least at that temperature and of course the temperature increases towards the outside.

Experiments with Calcite Crystals

Next sample used was a single calcite crystal with hole drilled in the center. This sample was submitted to heat until the center was at 1750 deg. F., 100 deg. F. above atmospheric decomposition pressure. The sample was then withdrawn and it was noted with surprise that there was only a film of CaO on the outside, and the major portion of the inside was still crystalline, with all the optical properties of calcite crystals.

Another calcite specimen was then put through the same "Transformation Point Determination" test as the first limestone sample. Fig. 2 gives the results. It will be noted that there is only a slight, barely noticeable, deflection at 1650 deg. F., and from that point on until 1720 deg. F. nothing much occurs. At 1720 deg. F. the two lines begin to separate, proving that the decomposition rate is increasing, but the difference increase is not so pronounced as in the case of Fig. 1, proving that decomposition is much slower, and that of the heat imparted a great deal goes to raising the temperature of the active body.

At a temperature of 1780 deg. F., the speed of reaction begins to get greater, but decomposition is not complete until a temperature considerably above 1800 deg. F.



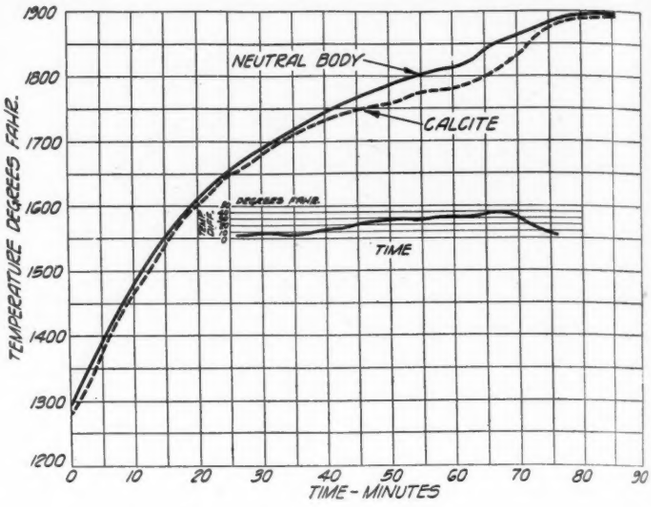
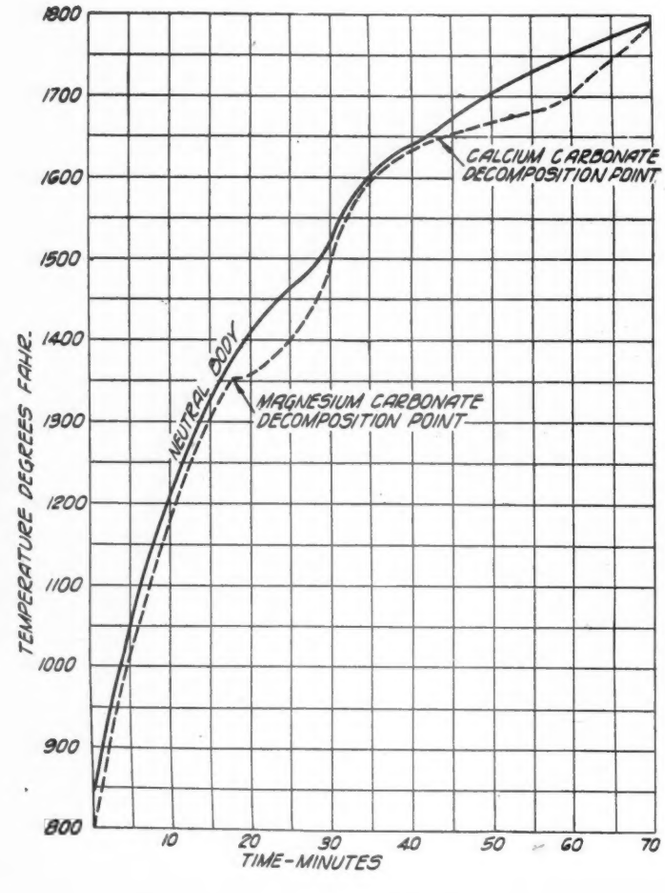
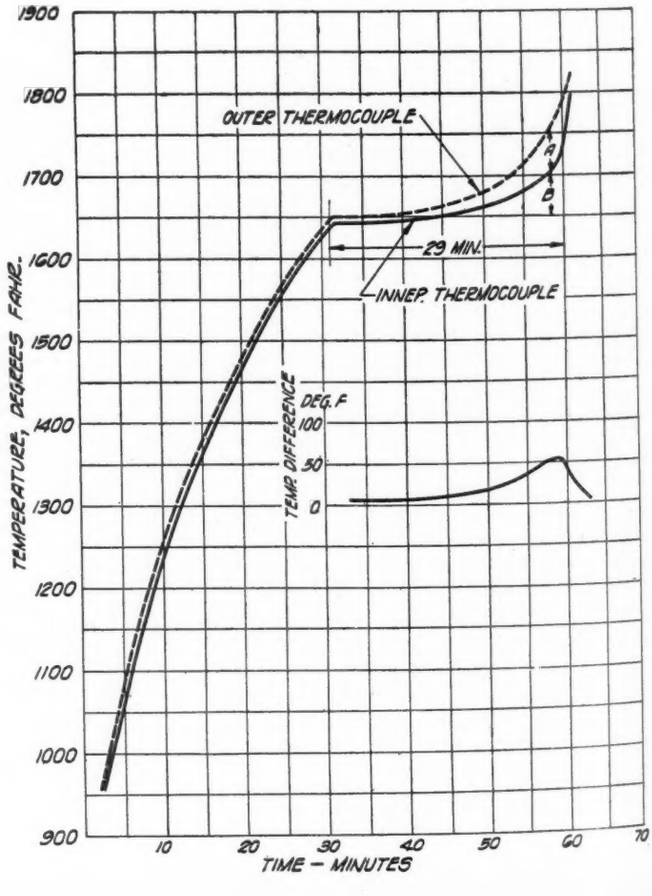


Fig. 1.—Upper left hand—"Transformation curve," for a high-calcium limestone. Fig. 2.—Above—"Transformation curve" of single calcite crystal. Fig. 3.—Lower left hand—"Transformation curve" of a magnesium limestone. Fig. 4.—Below—Results of tests with larger specimens of limestone. Smaller charts on Figs. 1, 2 and 4 show the temperature difference between neutral and active bodies





Over 45 minutes were necessary to decompose a sample of calcite when only half that time was necessary for the limestone. The average temperature of the calcite crystal center for that time was 1765 deg. F., while the limestone center temperature was only 1690 deg. F.

In view of the fact that the heating points of the two bodies are close together in the early stages, this proves that the difference is not accountable by heat conductivity; it must be due to the pressure created and the consequent increase of decomposition point pressure. Since the last CO_2 was driven off at a temperature of about 1800 deg. F., the pressure at that time must have been, considering the size of the sample, unbelievably great.

It will be noted that even the "Neutral" body varies in temperature increase increment at different times. Any great activity in the active body will affect the "Neutral" body due to their proximity. When the "Neutral" body temperature rise decreases, that is an indication that the rate of calcination in the "Active" body was increased. Of course, the fact that furnace temperature raising rate is reduced in the higher ranges should also be kept in mind.

Difference Between Magnesium Limestone and True Dolomitic Limestones

The third chart (Fig. 3) represents results obtained with Charles Warner Co., Cedar Hollow limestone. This stone contains magnesium and calcium. However, it was not known whether the combination was a mere mixture, or the stone was a true dolomite. The test proved that the stone was not a true dolomite. The magnesium and calcium decomposition deflections were quite distinct. Magnesium carbonate decomposition began at 1357 deg. F. and was finished at about 1470 deg. F. Calcium carbonate decomposition began at 1650 deg. F. and terminated at between 1700 and 1800 deg. F., the exact point not being apparent.

The same peculiarity of temperature rise in the center of the specimen due to increase of pressure is observed here, as was in the cases of the high calcium limestone and calcite, but this time in a varying degree. It also appears that the CO_2 from $MgCO_3$ had greater difficulty in escaping than was the case with the CO_2 from $CaCO_3$.

According to accepted tests the decomposition of dolomite should take place at about 1540 deg. F. Free magnesium carbonate decomposes at about 1120 deg. F. Why should the $MgCO_3$ in this stone decompose at 1355 deg. F.? The two carbonates do not appear to be in either a physical mixture or in chemical combination. Are they in solid solution?

White Lime Co., St. Genevieve, Mo., limestone was used and two holes were drilled into the specimen. One was in the center and the other immediately adjacent to the edge. Noble metal thermocouples were inserted, and then the test proceeded in the same way, readings being taken every two minutes and 30 seconds apart by stop watch.

At 1650 deg. F., when the decomposition started, the curve was rather flat for a considerable time, then it curved up. While initially the temperature difference between the first and second thermocouple was only 7 deg. F., this difference gradually increased until the maximum temperature difference was 55 deg. F. The difference expresses quite well the relative conductivity of stone and lime. In the chart, the distance *A* is explained by the pressure built up by the CO_2 and *B* to the insulating effect of the lime; consequently, when the core in even this small sample (only 5/8 in. in diameter) is burned, the temperature of the outside

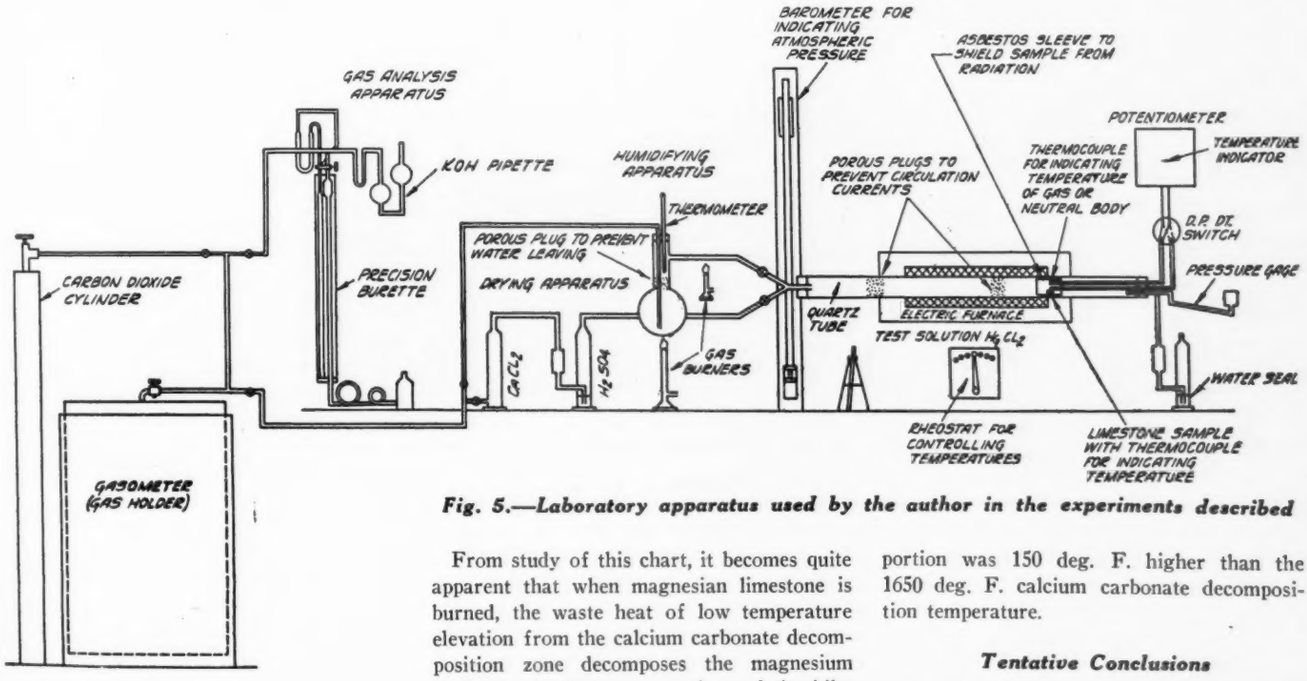


Fig. 5.—Laboratory apparatus used by the author in the experiments described

From study of this chart, it becomes quite apparent that when magnesian limestone is burned, the waste heat of low temperature elevation from the calcium carbonate decomposition zone decomposes the magnesium carbonate in the upper portions of the kiln. The difference between the two points is 300 deg. F., which means that action in kilns burning magnesian stone of this character begins this much earlier. The lower amount of heat necessary for the decomposition of $MgCO_3$, together with this lower temperature, practically means that otherwise wasted heat is utilized, and that in figuring kiln efficiency with such stone to bring it on an equal basis with a kiln burning high calcium limestone, no account should be taken of the magnesium. The efficiency of a high calcium kiln with a ratio of 3 lb. of lime per pound of coal is the same as that of a kiln with a ratio of 4 to 1 burning stone containing a large amount of magnesium carbonate.

The test represented by Fig. 4 was conducted under somewhat different conditions. In this case, a larger sample of Peerless portion was 150 deg. F. higher than the 1650 deg. F. calcium carbonate decomposition temperature.

Tentative Conclusions

From all of this, it becomes apparent that the conventionally assumed decomposition temperatures are important as far as the starting point only is concerned. From there on, there are bound to be great deviations due to porosity, conductivity or insulating qualities, size of grains, etc., of lime and limestone. It is quite likely that this method of testing will give all the information necessary to properly judge the burning qualities of different limestones and compare them numerically. The work done this year is preliminary in character and the results obtained are not considered conclusive. The method is being refined and testing is continued.

The diagram Fig. 5 shows the arrangement of apparatus used in making the tests described.

Making Portland Cement with Raw Materials Dredged from San Francisco Bay

Pacific Portland Cement Consolidated Plant at Redwood City Is a Fine Example of Modern Cement Plant Operation

OYSTER shells and mud from the sea bottom have been used as the raw material for cement at different times and places, both in the United States and foreign countries, but the plant of the Pacific Portland Cement, Consolidated, at Redwood City, Calif., is one of two plants erected in this country with the idea of using only such material and providing for the handling and grinding of the shell in a scientific way. Chemically, of course, there is not much difference between shell and mud and limestone and shale (or clay) as cement materials, many limestones originating in shell beds and shale originating as mud on the bottom of lakes and in the ocean.

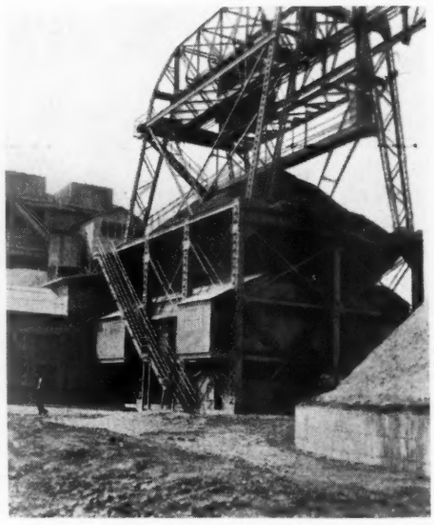
The shell used at the Redwood City plant corresponds to a pure high calcium limestone, as the following analysis shows:

	Per Cent
Calcium Carbonate	97.00
Silica	0.30
R_2O_3 (Iron and Alumina)	0.56
Magnesium Oxide	0.35
Organic "blue"	1.79
	100.00

The organic matter is a sort of cementing material secreted by the oyster, which acts as a binder.

The mud which is pumped up with the shell has the following composition:

	Per Cent
Silica	62.69
Iron Oxide (Fe_2O_3)	7.14
Alumina	17.52
Calcium Oxide	2.51
Magnesium Oxide	4.15
Potassium Oxide	2.45
Sodium Oxide	3.51
	99.97



Hopper at the end of the craneway

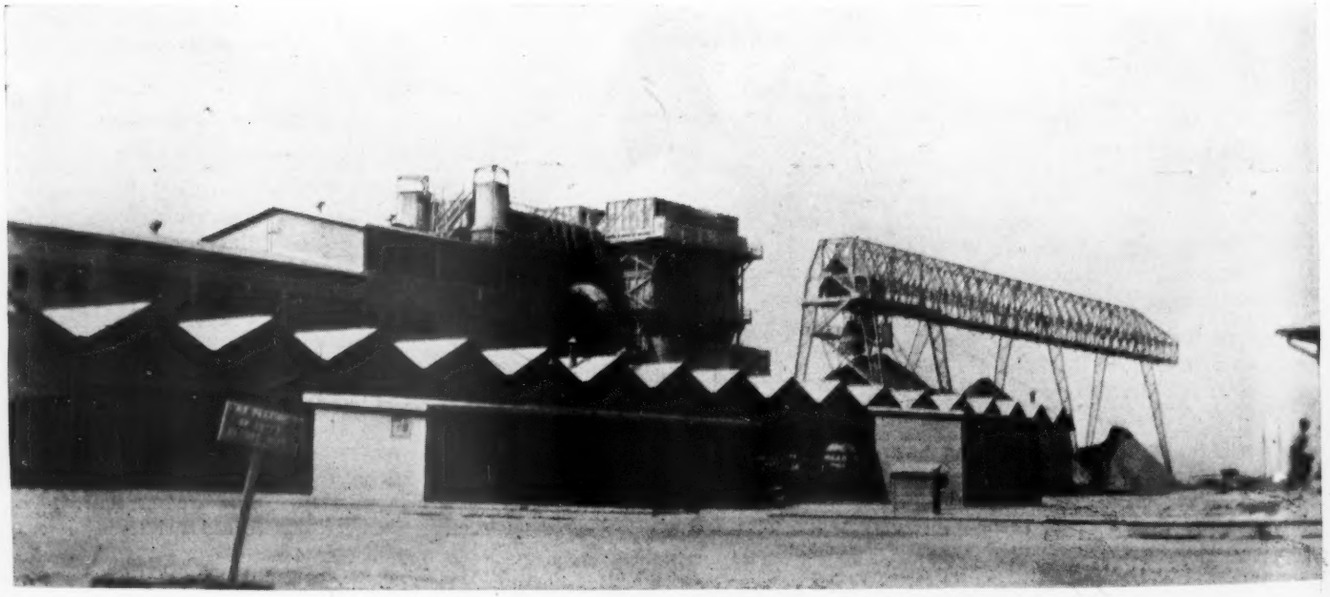
Dredging Operation

ROCK PRODUCTS published a fairly complete account of this plant when it began operations in 1924. So this story will deal more with the process and some of the details than with the plant as a whole. Briefly, what corresponds to the quarry operation at most cement plants is the pumping of oyster shells from the bottom of the bay by a 12-in. suction dredge. The beds cover many acres and average 30 ft. in thickness. They are dredged as sand and gravel commonly is, and a Swintek traveling suction screen is used to keep any large lumps from entering the suction and also to dig the shell. The pump discharges directly to barges and the discharge contains an approximately correct mixture of clay and shells.

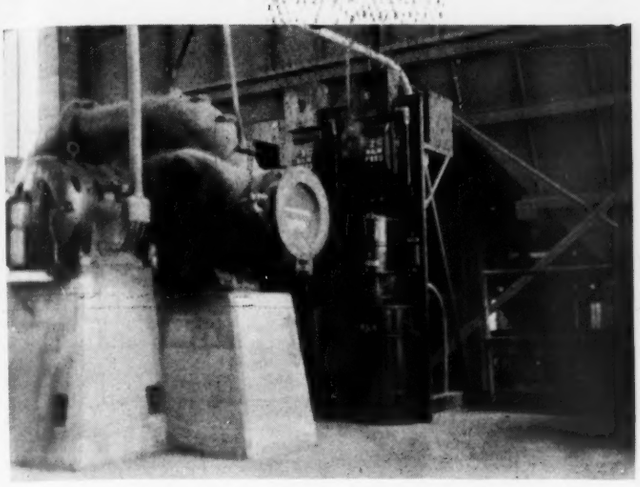
The barges are unloaded with a 4-yd. clamshell bucket and go either to two 80 ft. storage tanks set 35 ft. in the ground or to a hopper from which they are fed to slightly inclined screw conveyors which are used as washers in the event that there is excess clay with the shells. From this screw the shells are fed by horizontal screw conveyors at right angles to three compeb mills.

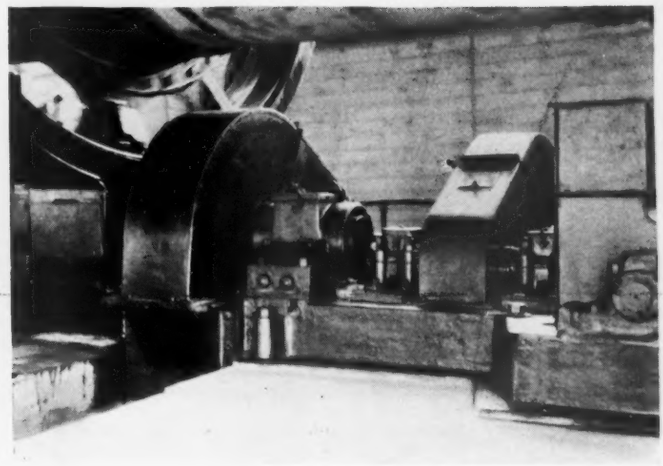
Grinding a Special Problem

Steel balls are used for grinding and the



The buildings in front contain the warehouses and repair shops of the plant. At the right is the crane by which the shells are unloaded from the scows





Left—Blower for one of the oil-fired kiln burners with motor and switchboard. Right—Gearing for driving a kiln. All gears run in oil

mills are driven by 500 hp. Allis-Chalmers synchronous motors. The grinding of shell is somewhat different from the grinding of limestone.

When ground limestone is examined under the microscope the plus 200-mesh particles are in the form of lumps, of which all three dimensions are appreciable. If one examines an oyster shell closely it will be seen to be built up of thin laminations. When the shell is ground the product, examined under a microscope, is seen to consist of scales or plates. These plates may have a greater length and breadth, but are only 300 mesh in the other dimension. Since the clay as delivered to the plant will all pass 200 mesh, the raw material as it is sent to the kilns is much finer than it usually is found to be in a cement plant. This fine raw grinding has an important effect on the character of the cement.

Slurry Handling

The ground material is lifted to the slurry tanks by Wilfley slurry pumps. There are 13 slurry tanks, each 18 ft. in diameter and 40 ft. high. They look from the outside like the old "Pachuca" tanks which were employed at one time as slurry agitators, but the system of agitation is quite different. Instead of a central air lift there are 16 lifts which are set near the periphery of the tank. These bubble in turn so that the slurry is not only agitated but given a slow revolving motion in the tank that helps to mix it thoroughly. Agitation is carried on all the time by automatic mechanism which thoroughly agitates the contents of each tank at short intervals.

Air for agitation is furnished by an angle compound Sullivan air compressor.

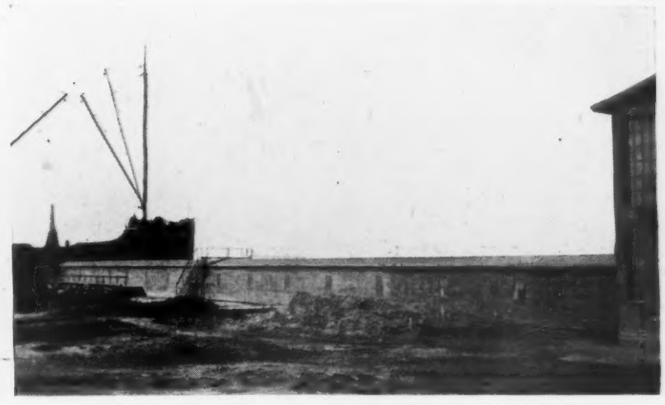
Air separator in the finish grind department

Oil-Fired Kilns

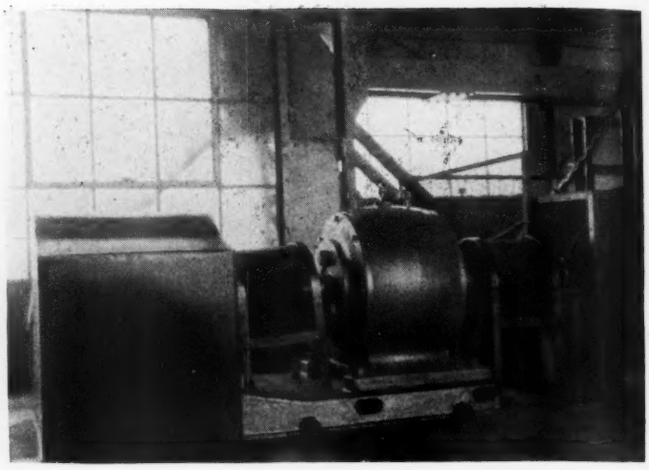
From the slurry tanks the slurry goes to the two oil-fired kilns which are 235 ft. long and 10 ft. in diameter and of Allis-Chalmers make. The kilns are in a splendid reinforced concrete structure with so many windows that it is almost as light inside the building as out. The picture of these kilns, published in Rock Products, November 29, 1924, has been many times reproduced in magazines and papers on both sides of the Atlantic, and it would be difficult to conceive of a better example of industrial architecture than that formed by the kilns and their surroundings.

The drive of these kilns is through systems of gearing, each of which is connected to a 75-h.p. motor. The motor is belted to a large pulley which is on the shaft of a worm gear and this drives a pair of reduction gears. All the gears run in oil baths, transmitting the motion with a low loss in friction.

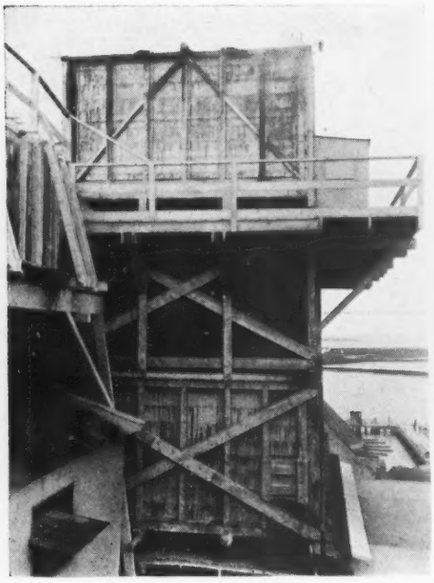
The oil burner is of a design which has

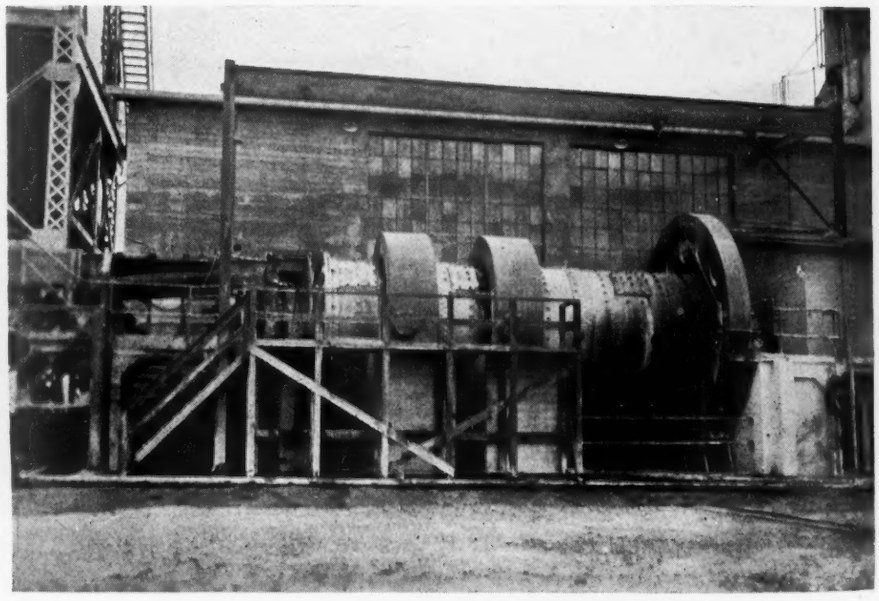


Left—Steamship loading at the plant dock. Right—The 600-ft. conveyor gallery connecting the dock and the packing plant

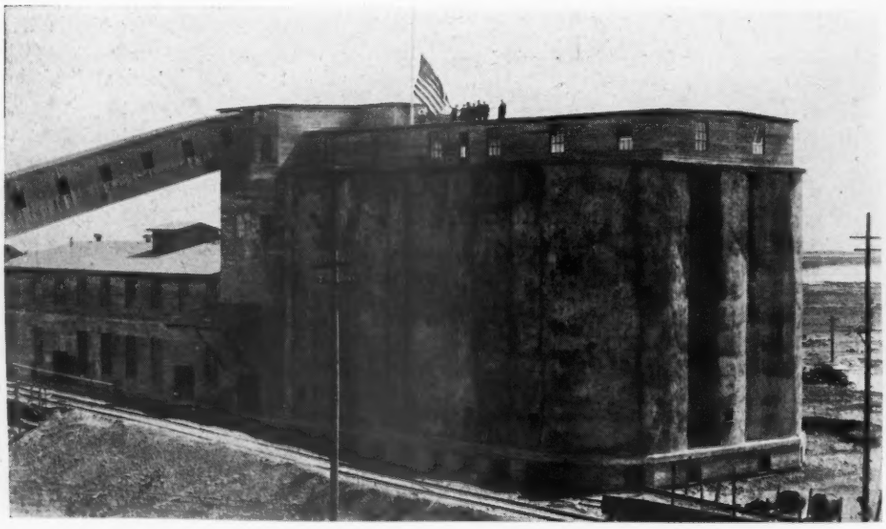


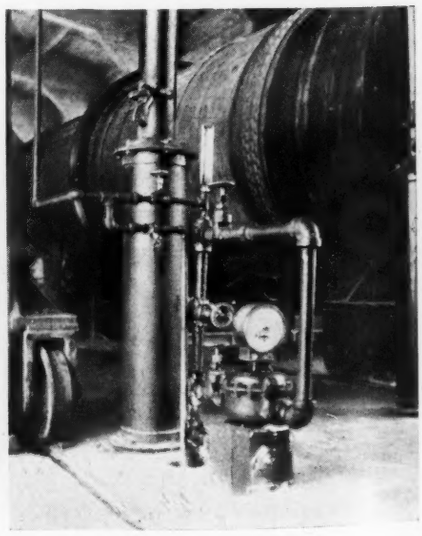
Left—The inclined screw conveyor which is used as a washer when necessary. Right—Typical motor installation showing how completely everything is guarded





Left—Building which houses the precipitating plant. Right—One of the three compeb mills used for raw grinding





Left—Storage silos and packing house. Right—Metering and regulating devices for the oil burners on the kilns

been developed at the plant. The oil is atomized by air furnished by a General Electric Co.'s blower direct connected to a motor. An indicator on the oil line shows the consumption of oil not only as a total but at the moment at which the reading is taken.

The burned clinker falls into two 60-ft. coolers and then by a Peck conveyor to clinker storage or to the finish grinding plant. At this point a "Weighometer" is inserted which records totals and also shows the weight of clinker passing at any moment.

The kiln house. The raw grind plant is in the rear

This was made by the Merrick Scale Co. of Passaic, N. J.

Storing and Packing Cement

The clinker storage is on a flat concrete slab at one side of the plant. When clinker is carried in storage it is fed through openings in the slab to a Link-Belt carrier conveyor. This conveyor operates regularly to carry clinker from the coolers directly to the finish-grind plant.

In the finish-grind plant there are two 7x26-ft. compeb mills driven by Allis-Chalmers synchronous motors. The grinding is very fine, almost all of it passing 100 mesh and 90% passing 200 mesh. From the mills the cement is elevated and sent by screw conveyors to the concrete storage silos and from these to the Bates valve bag packers and the loading conveyors.

Gayco air separators are used in connection with the finish grind mills.

Few plants have so many ways of loading and delivering the product. On one side of the plant are the tracks for car loading and the bins for truck loading, for a considerable part of the production finds its market within trucking distance. The remainder is shipped by water and boats load directly at the company's dock where there is 26 ft. of water at low tide.

The packing plant is connected with the dock by a 30-in. belt conveyor with 600 ft. centers. This is covered in by a long gallery.

This conveyor also serves to count the sacks for as each passes into the gallery it strikes a tripper arm that operates a mechanical counter.

Salt and Other Dusts Removed

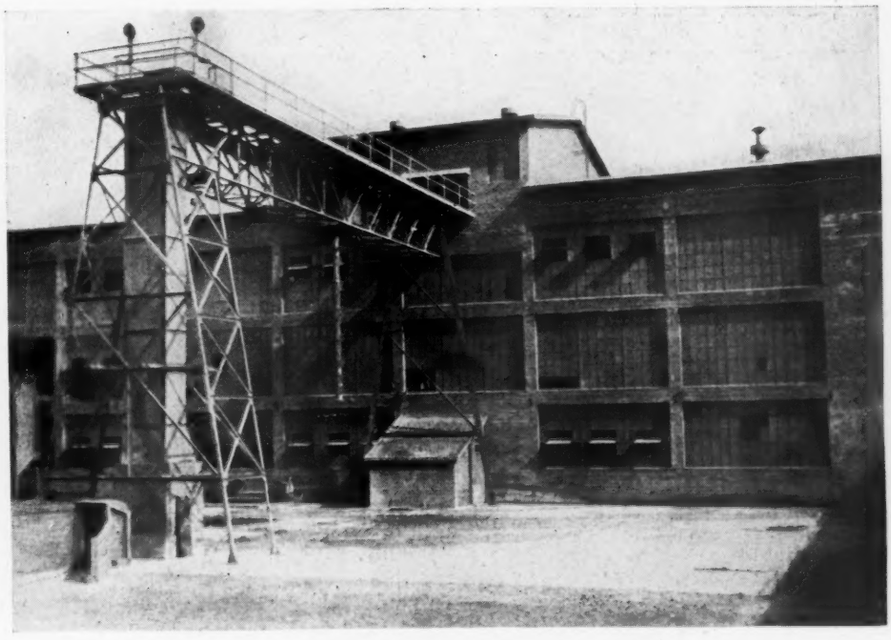
One expects to find a newly built cement plant clean and provided with efficient safety devices, but this plant has gone farther than most in the directions of dust prevention and safety of the workmen. The gases from the kilns are first of all put through a washing device which removes the greater part of the solids. Then they are passed to Cottrell precipitators which remove the last trace of solids from the gases. At times a little water vapor escapes into the air but that is all. Electricity for the precipitators is furnished by motor generators and plate rectifiers of General Electric make. A 75,000-volt current is sent to the precipitators.

All elevators and other machines from which dust would rise are enclosed and connected to a dust collecting system by which the dust is drawn off by a suction fan. In no part of the plant is there dust enough to be noticeable.

Safety devices surround all the moving machinery that could be dangerous. There are only four belts in the entire plant so the belt danger is almost eliminated. All the motors are connected to Foote Bros. speed reducers and a typical example of the protection given such drives is shown in one of the pictures. The motor is enclosed in a sheet steel housing, the shafts in and out of the speed reducer are enclosed in heavy steel wire screen cloth and the speed reducer has its own covering. Floors are either of cement or of cast iron plates which are roughened to prevent slipping. The plant has a very high no accident record and the completeness of the safety devices is such that it is difficult to see how a man could be injured without the grossest carelessness.

An Early High-Test Cement

The raw materials and the process are such that the product of this plant may be classed as a quick-hardening cement, not so quick to harden as *ciment fondu,* but corresponding to the "high test" portland cements made in Europe. The writer saw 3-day briquettes (of 1 to 3 mortar) that broke at 300 lb., and was shown reports of other that broke



Clinker storage. The structure supports a carrier conveyor for recovering clinker from storage

at 340 lb. An unusual test of the early strength of this cement occurred on a California concrete highway when a freight car ran off the track and on to the highway when the concrete was only three days old, without doing any injury to the concrete.

This early high tensile strength, the chief chemist says, is due in part to the nature of the raw material which permits of grinding to a practical 300 mesh before burning. This enables the making of a cement that is both sound and high in lime. An average analysis contained 65.45 lime with a low magnesia content. It would be possible to grind limestone equally fine but it would be more expensive than to grind shell which naturally disintegrates into flat scales of 300-mesh thickness. Hence there is an advantage in using shell as cement material wherever it is available.

The main office of the Pacific Portland Cement Consolidated is in the Pacific building, San Francisco.

The officers of the company are: President, Robert B. Henderson; vice president, John D. McKee; secretary, H. T. Battelle; vice president in charge of all operations, J. H. Colton; purchasing agent, R. F. Herrod; chief engineer, A. G. Lang. H. M. Powers is superintendent of the plant and O. D. Small is chief chemist.

Effect of Sulphate Waters on Portland Cement

AN article entitled "Disintegration of Portland Cement in Sulphate Waters," appeared in the May, 1925, issue of *Industrial and Engineering Chemistry*. This article was written by Thorbergur Thorvaldson, Rae H. Harris and David Wolochow as a result of investigations conducted in the laboratories of the University of Saskatchewan, Saskatoon, Sask., Canada, on the action of water and sulphate solutions, with and without the presence of other salts, on the permanency of portland cement concrete.

These investigations were instigated by demonstrations of the failure of some concrete structures exposed to sea water and to ground waters in the Western States and the Prairie Provinces of Canada; ground waters in these localities having relatively high percentages of sulphates.

Experiments were conducted on briquets of neat cement, which were made according to the usual engineering practice, except that distilled water was used, and cured in damp rooms for 28 days, studying the development of alkalinity when samples of the briquets were shaken with water and solutions of sodium sulphate. These experiments showed that the alkalinity increased with the time of shaking and with the concentration of sodium sulphate present. In each case the alkalinity of the solutions increased to a certain maximum; this maximum was greater in the case of sulphate solutions than in the case of water due to the fact that when the water solutions became saturated with calcium hydroxide further decomposition of the calcium silicates resulted in the formation of calcium hydroxide crystals which settled out leaving the liquid phase unaltered, while in the presence of sodium sulphate, gypsum crystals formed which separated out leaving sodium hydroxide to increase the alkalinity beyond that of a saturated solution of calcium hydroxide. Furthermore, the experimental data showed that the alkalinity after reaching this maximum always decreased distinctly. This was assumed to indicate that the total alkalinity was also due partly to the solution of tricalcium aluminate and that this decrease in alkalinity was due to the formation of less soluble aluminates.

Further experiments were conducted on the extraction of lime from the hydrated cement. Twenty gram portions of the set cement being shaken with a liter of two sulphate solutions for 10 months, allowing equilibrium to be reached, also by extracting with portions of water and sulphate solution until practically no more lime could be removed. Data from these experiments showed that 23.1% of the CaO was extracted in the 10 months with a 4.63% sodium sulphate solution and 24.4% with a 9.26% sodium sulphate solution. By extraction with 32 one-liter consecutive portions during the course of a year 72% of the lime was extracted by water and 84% by a 1.64% solution of sodium sulphate. This showed that, although the main action is the extraction of lime, yet during the later stages both silica and alumina are removed. The amount of material extracted indicates also the importance of making impermeable concrete even when in contact with fresh water.

O. D. Small, chief chemist of the Redwood City plant

A study of the effect of chlorides on the development of alkalinity in portland cement-water and portland cement-sulphate mixtures showed that: calcium chloride, as is to be expected, has an inhibiting action; sodium chloride solutions develop greater alkalinity than that produced in distilled water yet less than that developed in a corresponding concentration of sodium sulphate; that the presence of sodium chloride in 7% solutions of sodium sulphate has practically no effect.

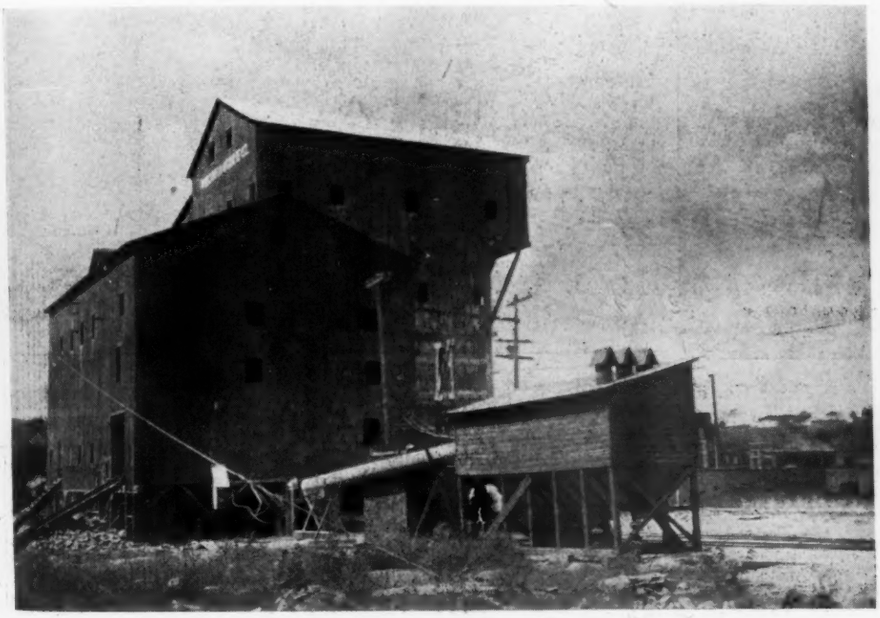
The experiments indicate that the disintegration of portland cement may take place in sulphate solutions without the much talked of physical effect of crystallization of substances with an increase of volume and consequent disruption playing any part. On the other hand, under certain conditions, especially when a structure is exposed to alternate drying and wetting, crystal formation and frost represent the final cause of the disruption of material already weakened through chemical disintegration.

The chemical laboratory of the Pacific Portland Cement Consolidated plant

How Quartzite Producers Found and Developed New Markets

When South Dakota Quarries Could No Longer Sell Building Stone They Found Other Uses for Their Product

THE quarrying and crushing of quartzite in South Dakota is an industry that shows the value of studying one's product and finding the uses to which it may be adapted. Originally all the quarries of this section were opened to produce building stone and paving block, and under the name of "South Dakota granite" the stone had a widely-extended vogue in the days when the "emphatic" stone masonry of the architect Richardson and his followers was in fashion. But that went out of style and the use of paving block diminished with the coming of the automobile so that other markets had to be sought and found.



Crushing plant of the Wisconsin Granite Co. at Sioux Falls, S. D.

They were found, and some of them at long distances. As concrete aggregate, the rock is shipped as far south as Kansas City, Mo., and Topeka, Kan., and as far east as Indianapolis. As stucco aggregate (pebble dash), it is shipped all over the country. A lot of it goes into residences on Long Island and in the suburbs of Washington, D. C. Cincinnati has been using much of it of late and so have some of the suburban towns in New Jersey. As furnace lining, there is a considerable shipment to the steel furnaces near Chicago. And the very dust which is collected from the crushing plants is found to have a high market value for making scouring soaps and "cleanser" compounds. Sioux City, 100 miles away, is perhaps the largest market for aggregate. It is the basis of its famous concrete pavements together with a particular construction method.

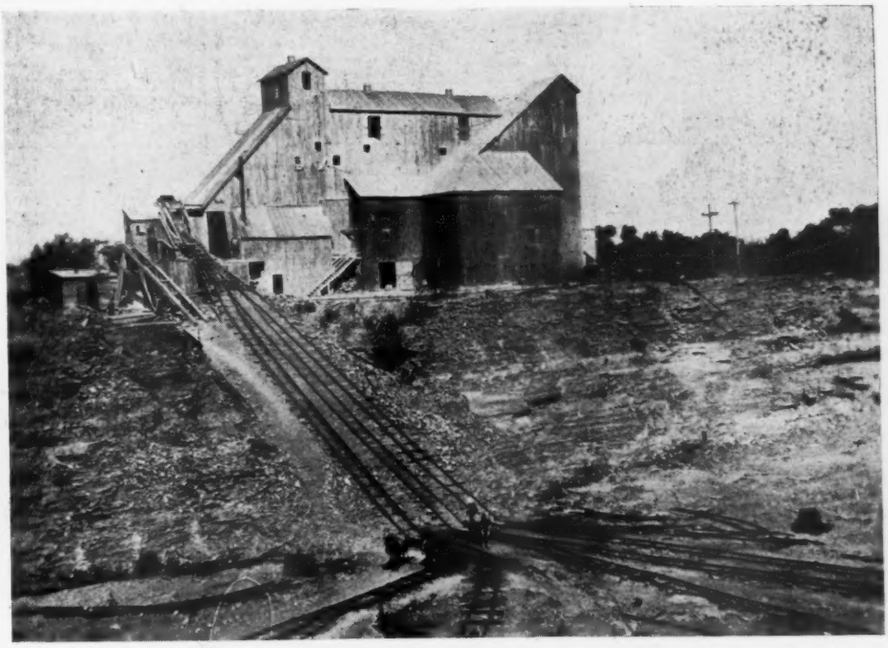
A rock that has so many uses and which can be shipped such long distances must have some unusual characteristics, and this South Dakota quartzite has them. One is its color, which is a rather dark red, with a purplish cast, in pieces the size of one's fist. But because it is slightly translucent, the finer the rock is crushed the lighter the color becomes. In stucco aggregate size, between ¼ in. and ⅛ in., it is of a beautiful rose-pink. And the dust is a very pure white without a trace of the yellow or blue tint which often discolors finely ground minerals.

Called a Granite, but Really a Quartzite

Although it has been locally called a "granite," it is a true quartzite, a sedimentary and not an igneous rock. It is almost pure silica, a specimen from one of the Del Rapids quarries having this analysis, which is almost as high in silica as a good glass sand:

Silica	99.14%
Iron oxide (Fe_2O_3)	0.50%
Alumina	0.28%
Lime (CaO)	Trace
Magnesia (MgO)	Trace

Not all of it runs so high in silica, but



Plant and quarry of the Wisconsin Granite Co. at Del Rapids, S. D.

practically all the production runs above 98% SiO_2 (silica).

The crushing strength, according to Bureau of Public Roads tests, is 51,700 lb. per square inch. Its French coefficient of wear varies at different quarries from 17 to 19.

When it is used for furnace lining it has the same physical qualities as the quartzite which is so much quarried and used for making silica brick and other refractories in Pennsylvania under the name of "ganister rock." That is, it is not affected by temperatures up to 3200 deg. F., except that it expands and contracts without disintegrating.

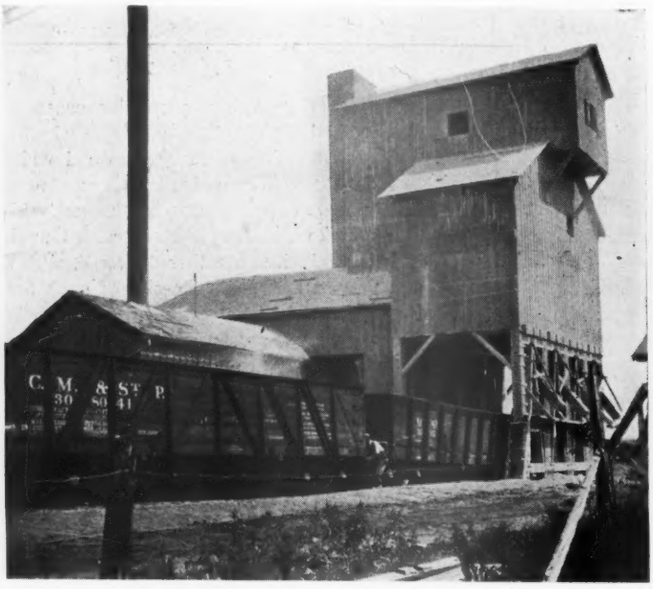
The rock is quarried on both sides of the Minnesota-South Dakota line, at Luverne, Jasper and New Ulm, Minn., and at Sioux Falls and Del Rapids, S. D. Only the South Dakota quarries were visited in preparing this article. There are three of these, one at Sioux Falls, belonging to the Wisconsin Granite Co. of Chicago, and two at Del Rapids, one of which also belongs to the Wisconsin Granite Co. and the other to the Simpson Stone Co., which is a local organization. The Simpson quarry still produces some building stone and recently made a shipment of stone which is to be used as veneering over concrete block, as faced brick is sometimes used. But the paving block business is practically non-existent in this section.

Although these three represent all the going industries, there are a great many places where the ledge has been opened and some production made for local use in times past for both building stone and paving blocks.

Quarry Practice at Sioux Falls

Of the three plants mentioned, the Sioux Falls plant of the Wisconsin Granite Co. is the largest and the best equipped. It operates all the year around and at times its daily output reaches 700 tons a day. About 20,000 tons is shipped each year to what may be called the local market; that is, within a 20-mile radius, this market being mainly in Sioux Falls, for use in street paving and buildings.

The quarry face is 60 ft. high and it is worked as a limestone or trap rock ledge would be, by well drilling and blasting. A 6-in. Armstrong drill is used and holes are put down 5 ft. below the quarry floor. Ow-

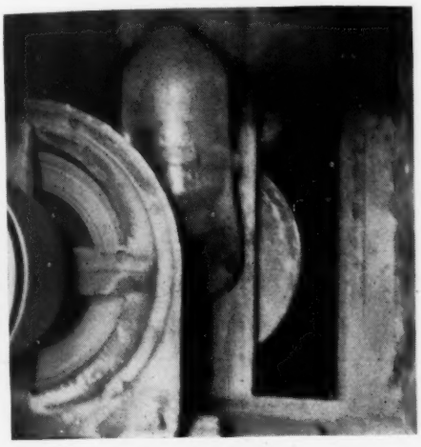


Left—Crushing plant of the Simpson Stone Co. at Del Rapids. Right—Quarry of the Simpson Stone Co., which still produces some building stone

Left—Quarry of the Wisconsin Granite Co. at Del Rapids. Right—Hotel at Del Rapids, an example of the stone masonry that was fashionable when the quarries were famous for the production of building stone

ing to the abrasive quality of the rock the bits lose the gage rapidly and 7 ft. is considered a fair day's progress. Very little stripping has to be done, as the surface of the ledge is bare in most places.

Drilling is so expensive that the holes are set as far apart as they can be and have the rock break well. In other words, it has



Blower with motor and connections

been found cheaper to use more powder and few holes. The standard spacing for holes is 18 ft. and they are set 20 ft. back from the face. They are loaded with all they will take of 60% blasting gelatine. Cordeau is not used, the holes being fired in the ordinary way by a battery and electric caps. Plenty of powder is needed to get good fragmentation and where the larger pieces have to be broken mud capping is resorted to, to save the expense of drilling block holes in such hard rock.

All loading is by hand. A fork is used for loading the fines, for there is a little dirt that falls from the surface and from the seams and every effort is made to produce only clean stone. What the fork leaves behind is shoveled into piles and from time to time it is sent to a dump. The manner of doing this is interesting. The cars are run on a track to a point below a derrick which lifts car and contents to the surface, where the cars are dumped into a hopper. Trucks take the fines from this hopper to a waste dump.

Abrasive Rock Hard on Crusher Parts

The cars, which are end-dump and built of steel at local shops, run from the face to the bottom of the quarry incline by gravity and the empty cars are pulled back to the face by horses. There are two inclines up which the cars are pulled by a friction hoist. Usually only one is used, that leading to the primary jaw crusher, but when the primary crusher is being repaired cars may be drawn up the other incline and dumped to the secondary crusher.

The primary crusher is a 24x36-in. Allis-Chalmers, Blake type. Although manganese jaw plates are used, the rock is so abrasive that the crusher has to be set up every week, or perhaps oftener, and the same is true of the secondary crushers. In these crushers reversible concaves are used so as to get the most wear possible from them.

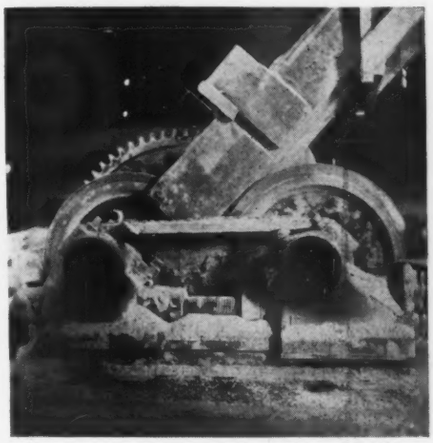
The primary crusher discharge goes to a 30-in. bucket and belt elevator which lifts it to a 48-in. by 20 ft. scalping screen with 2½-in. openings. This is of manganese steel. The oversize goes to a No. 6 style K Allis-Chalmers gyratory and the undersize to a bucket and belt elevator which lifts both to the main sizing screen. This is 60 in. in diameter and 24 ft. long. The oversize of this screen goes to a No. 4 style K crusher and the discharge of both crushers is returned to the screen by a 24-in. elevator.

The products made by the screen are, between 2½ in. and 1½ in., between 1½ in. and 1 in., between 1 in. and ½ in. and between ½ in. and ¼ in. The product finer than ¼ in. is sent to a Mitchell screen with ⅛ in. square mesh. The oversize of this screen is sold for stucco aggregate and the undersize for furnace lining or ganister.

The plant is so constructed that the entire product can be made of 1¼ in. and finer stone, and this is done at times when there is an unusual demand for finer stone.

The plant is exceptionally favored for railroad shipments, as its track connects with all five of the railroads that enter Sioux Falls. These are the Great Northern, the Illinois Central, the Northwestern, the Rock Island and the Milwaukee.

The manager of the plant is H. J. Gal-



Rolls used for crushing stucco aggregate

lagher, who is well-known among the crushed stone producers of the country, as he has been connected with plants in New York and other eastern states and is a regular attendant at the National Crushed Stone Association conventions. He is an engineer and was in charge of construction on one of the important sections of the Panama canal.

Del Rapids Plant of the Wisconsin Granite Co.

Del Rapids is a very pretty town, about 20 miles from Sioux Falls. Although it has only 1600 inhabitants, it supports such luxuries as a park and a public bathing beach. The quarries are the town's main industry and everyone seems interested in them and the mayor is an enthusiastic stu-

Left—Fines are loaded with a fork at the Sioux Falls quarry to insure clean stone. Right—Quarry car at the bottom of incline, Sioux Falls quarry

dent or geology. Most of the larger buildings of the town are built of the quarry stone.

The plant of the Wisconsin Granite Co.

The men work in respirators where the exhaust fan cannot reach

at this place is somewhat smaller than that at Sioux Falls. The quarry practice is much the same, using an Armstrong well drill and spacing the holes 18 ft. apart and 20 ft. back from the face. The holes are chambered before being loaded with 60% gelatine, and the fragmentation is so good that little mud capping is required to break the larger pieces. The method of getting the broken rock to the crushing plant is the same as at the Sioux Falls plant.

Care has to be taken in placing and loading the holes, for the rock shows a disposition to slide forward as a mass on the quarry floor.

The plant has a No. 6 McCully crusher for a primary breaker. The crusher discharge goes by a bucket and belt elevator to the scalping screen, which is 48 in. in diameter and 16 ft. long. This has 2½ in. to ⅜ in. holes. The oversize goes to a No. 3 McCully, the product of which goes to the same elevator and into the same screen. The finer product of this screen is sent to a 48 in. by 12 ft. screen, which takes out a ½ in. to ¼ in. product and a 1¼ in. to ⅛ in. product, which is stucco aggregate. The ⅛ in. and finer product is sold for ganister.

Stucco Aggregate Plant

This plant makes a specialty of stucco aggregate and has a special plant for making it in which the coarser sizes from the main crushing plant may be recrushed to stucco size. The first crusher in this plant is a Symons disc crusher, 24 in. plates, which breaks everything to ¾-in. and finer. The product goes to a McCully rotary screen which is 40 in. in diameter and 16 ft. long. This makes stucco aggregate and ganister and oversize which goes to a pair of No. 18 Weller rolls. The discharge of the rolls is returned by an elevator to the same screen.

In both these plants every effort is made to preserve the health of the men, for working in the abrasive silica dust is bad for the lungs. All the machines are connected to the exhaust system of a fan which draws out the dust and deposits it in a collecting house at the rear of the building. This dust has a commercial value that pays for the cost of collection, so a safety device, as so often happens, is economical as well as sanitary. At the primary crushers and other points which are not connected with the exhaust system the men wear both goggles and respirators.

Electric power purchased from a local company is used in both these plants with Allis-Chalmers and Westinghouse motors.

Roy Johnson is manager of the Del Rapids plant. He was raised in this locality and was a stone cutter and quarryman by trade, but abandoned this work for large-scale quarrying and worked his way through various jobs to the position of manager.

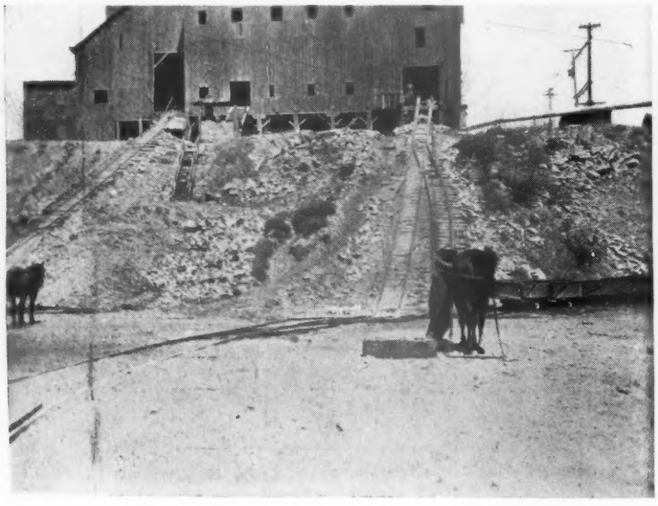
The Wisconsin Granite Co., which has quarries in Wisconsin as well as in South Dakota, is one of the well known producing companies of the country. W. S. Primley is president and John J. Sloan, former president of the National Crushed Stone Association, is secretary and manager.

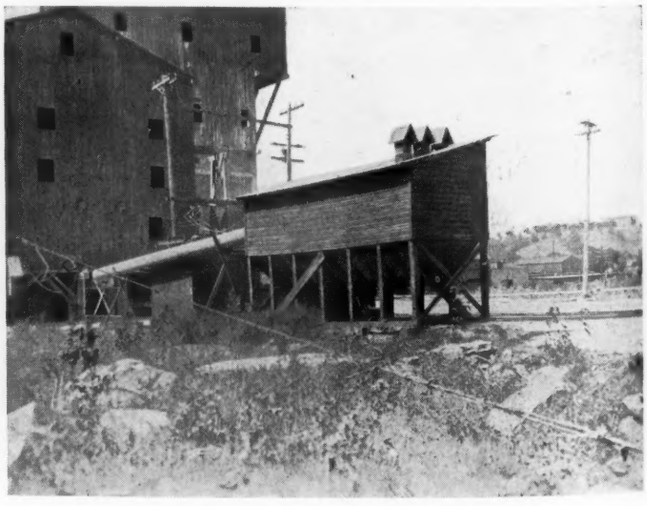
The Simpson Stone Co.'s Plant

The Simpson Stone Co. of Del Rapids is somewhat unusual from the fact that the

H. J. Gallagher, manager, Sioux Falls quarry, Wisconsin Granite Co.

principal owners and officers of the company are women. Cora Simpson is president, Nellie G. Simpson, vice-president, and Mary L. Simpson, secretary. F. A. Bailey is manager.





Left—Horses pull back the cars from the bottom of the incline at Sioux Falls. Right—The bag house for collecting dust at Sioux Falls

The Simpson quarry has not so high a face as the others and the rock is apparently somewhat more docile. The face is carried at 40 ft. and holes are put down with a 4¾ in. Sparta drill driven by a gasoline engine. They are set 18 ft. apart and 25 ft. back. The rock is not so "tight" as at the other quarries, the bedding planes showing clearly. This makes the rock break out in slabs and very little mud-capping is necessary to reduce the rock to one-man size.

On account of the way in which it breaks this quarry can produce building stone more easily than the others and still holds some trade in this material.

This plant is simpler than the others. It has a No. 5 Gates Allis-Chalmers crusher and one screen, the oversize going back to the same crusher and returning by the same elevator that took the original crusher discharge to the screen. A mixture of sizes from 2½ in. to ½ in. is produced for concrete aggregate and other purposes and a ½-in. and down product which is used for road dressing. A ¼-in. and finer product is used, as fine concrete aggregate and the local demand takes all produced.

This plant is driven by a steam engine. Negro labor is employed in both the quarry and the plant.

In the spring of each year all three of these quarries produce a large amount of one-man size stone which is used for riprapping. The railroads and nearby municipalities buy the material.

It is expected that the local demand for stone from these quarries will be increased in the near future. South Dakota had built only one mile of concrete road at the time this was written in 1925, but it is said that the state's program includes considerable paving and when the time for this has come the state will be fortunate in having so excellent a supply of aggregate near the largest city.

Modern Methods and Processes of Mining and Refining Gypsum*

Part VIII—Retarders and Accelerators

By Alva Warren Tyler

THE wide usage of calcined gypsum as it is employed today in the form of wall plasters, finishing plasters, casting, molding and dental plasters would be impossible without the knowledge of "retarders" and "accelerators" used in connection with these materials.

It is well known to those familiar with calcined gypsum in its unadulterated state and calcined at a temperature to give the usual practical results, that upon the addition of water the process of recrystallization begins to take place almost immediately and within a few minutes this recrystallization is complete. In other words, the gypgum has again taken up the water of crystallization it lost during the process of calcination and returned to its original rock formation. This process of recrystallization is commonly known as "setting" and when the process is complete the material is said to have *set*.

While the normal setting time of gypsum calcined from different deposits may vary considerably, there are none but what would be far too fast for use in their largest fields of application, as wall plasters and finishes, without a retarder.

On the other hand, there are few stuccos that would set sufficiently fast to meet the requirements in other fields such as in the manufacture of wall-board, gypsum tile, dental work, etc., without an accelerator.

It therefore follows that the distribution of calcined gypsum as a commercial product is dependent upon the ingredients having the properties of changing the setting time to suit particular needs. Fortunately such ingredients are readily available for either slowing or hastening the setting time as may be required. In fact, these properties are so well defined that within certain practical limits the stucco may be made to set in any pre-determined time.

"Retarder" is the commercial name for that ingredient, which when mixed with gypsum stucco lengthens its setting time, and "accelerator" the name for that ingredient which, when similarily mixed, shortens its setting time, the "setting time" referred to in this case being of course the normal setting time of the neat calcined gypsum, when mixed with water only.

THE previous number of this series (No. VII) by Mr. Tyler was published in the issue of Rock Products for August 8, 1925. This number completed the description of mining and refining gypsum up to the point where it was ready to be made into gypsum products. The present article and those which follow will have to do with the manufacture of products, not only wall plasters but wall boards, gypsum blocks and the other specialties which are of ever-increasing importance.—The Editors.

While there are many substances which will act as retarders and as accelerators, there are comparatively few which may be used commercially. In fact, there is no economic substitute for the commercial retarder, as it is manufactured and marketed today solely for the purpose of regulating the set of gypsum plasters. There are a number of substances which make good accelerators: substances so readily obtained that no special process is necessary for their production. For instance, one of the most common accelerators used by the gypsum manufacturers in the production of wallboard, block, etc., is the raw gypsum itself, introduced in the form of land plaster or ground gypsum. Ground anhydrite is also a very good accelerator and so is potassium sulphate.

The Bureau of Standards research workers at Washington have done considerable work in connection with retarders and accelerators, a record of their results having been published by the *Journal of the American Ceramic Society* (Vol. 6, No. 11, November, 1923) in an article by F. C. Welch, entitled "Effects of Accelerators and Retarders on Calcined Gypsum." Reprints of this article may be had by application to either the Bureau of Standards or the above mentioned journal. In this publication may be found a list of the various substances which act as retarders and those which act as accelerators when mixed with calcined gypsum, also theories as to the reactions involved.

Retarder, as it is known to the gypsum industry, is a specialty depending entirely on this industry for its existence. The two go hand in hand, since the great bulk of calcined gypsum carries its carefully proportioned percentage of retarder. It is a remarkable fact, however, that for years retarder was manufactured as a separate industry and even today a large number of

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gypsum manufacturers purchase their supply of retarder from outside concerns. Its manufacture is logically a part of the gypsum business and it is for this reason that it occupies space in this discussion.

The manufacture of commercial retarder while a comparatively simple process, requires exact methods and mixtures to insure

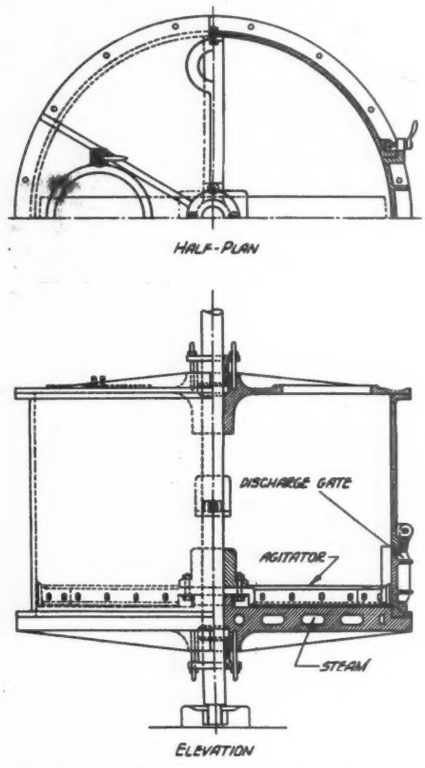


Fig. 1—Vat used in the continuous process

the uniformity of product so highly necessary in gypsum plaster manufacture.

Its chief ingredients are hair and lime. The hair is purchased from the most available and economical sources, and may be cattle hair, goat hair or hog hair. Any of these will do for retarder making, providing they are uniform in quality and have not been through any process that has sapped the life of the hair. Pig toes as well as the hair are very good for making a high strength retarder.

There is considerable variation in the process of manufacture, the earlier methods being to dissolve the hair by boiling in a solution of lime and soda ash. When the hair was all dissolved additional lime was added as a filler not only to reduce the cost but to dilute the strength to a practical value. Other ingredients are sometimes used, such as linseed oil meal and ground flaxseed. They have very little practical value, however, outside of producing a richer color, and may well be eliminated.

The dissolving of the hair is done in a large vat, usually steam heated and provided with a mechanical agitator or stirrer. When all the ingredients are in, the solution is boiled down to a thick viscous consistency, yet not too thick to pour readily. It is then poured out in shallow pans and delivered to a drying kiln where the remaining excess moisture is removed. The kiln is provided with a series of shelves and usually steam coils for heating, since they are easily regulated, it being important that the temperature be maintained at a comparatively low value so as to avoid any chance of burning.

The shallow pans are necessary in order to present as much drying area as possible and thereby speed up this phase of the operation. They are of such other dimensions as may be handled readily by one or two men. When the pans are filled they are stacked on trucks and delivered to the kilns.

When dry the thin hard cakes of retarder are removed from the pans and delivered to a preliminary crusher or grinder, such as a pot crusher of the coffee mill type, and from this to a finishing machine, such as a ball mill or hammer mill with air separator. Mill stones are not suitable for this work since the heat generated causes the glue like material to gum up the surfaces of the stones and nullify their grinding action.

When ground the material is delivered to bins from which it is drawn and sacked for shipment. It is well to let the finished product lie in the bins as long as possible to allow it to "age," as the strength increases with age and any particles of lime that may still be unslaked have an opportunity to complete their reaction.

The more modern method of producing retarder is by the continuous process which until a few years ago was considered impossible. The process was developed and perfected by one of the large gypsum manufacturers after a long series of experiments leading to the final demonstration of its practicability.

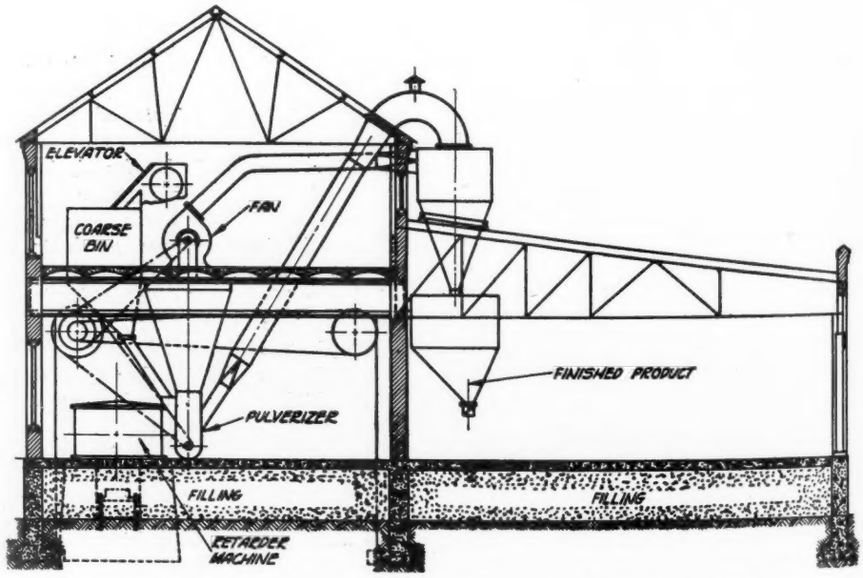


Fig. 2—Modern plant for the continuous manufacture of retarder

In this continuous process the retarder is completely finished (outside of the final fine grinding) in the vat in which it is made, and by this method a quantity of finished material can be produced in a few hours that by the old method would take days. The vat of course is of special design and construction to give great rigidity and strength necessary during that stage of the drying period when the viscous mass boils down to a very stiff sticky consistency. The vat is steam heated and is so constructed that it may be closed up air tight, after the ingredients are all in and the hair is in solution, and subjected to a vacuum for the purpose of quick drying at a comparatively low temperature. Low temperatures are highly important during the drying period, the same as in the older method, as a portion of the valuable elements are quite volatile and are liable to become liberated unless the temperatures are maintained at values well under 212 deg. F. Furthermore, there is danger of ignition if the temperatures are not tapered off during the last stage of drying. Fig. 1 illustrates a vat designed for use in this process, while Fig. 2 is an elevation of a plant of modern construction having a capacity of 10 tons of finished retarder per day. It will be noted that the retarder machines are followed by a grinding machine of the hammer mill type with air separation. Since one ton of retarder will treat approximately 275 tons of gypsum stucco, it will be seen that a plant of this size would have considerably greater capacity than would be required by most gypsum producers in the United States today.

The following are the usual formulae used in retarder making:

Wymore Formula (Original)

Hair	22.200%
Sodium bicarbonate	13.340%
Lime	44.500%
Potassium bicarbonate	6.675%
Linseed oil meal	13.340%

This formula is varied slightly by increasing the lime content about 4% and decreasing the linseed oil meal by the same amount. The linseed oil meal may be eliminated en-

tirely without appreciably affecting the strength of the retarder.

A formula frequently used, and due to its simplicity about as economical as the one given above, is as follows:

Hair	40.000%
Caustic soda	5.000%
Lime	55.000%

This formula is used mostly in the continuous process in which there is a loss of from 1.5 to 2% by weight due to chemical reaction.

The accompanying curves show the characteristics of various strengths of retarder as indicated by different percentages of hair used in its preparation and also the relative retarding values of a standard retarder when introduced into a standard plaster mixture in varying amounts. Fig. 3 shows the effect on the strength of retarder of using varying percentages of hair in its manufacture. Fig. 4 shows the relation between the quantity of retarder used and the setting time of the plaster mixture. Gypsum stucco mixed with clean, dry, sharp plastering sand in the proportion of one part by weight of stucco to 2½ parts by weight of sand was used in making these determinations.

Due to the high hair content and the relatively high cost of this ingredient, it is evident that any appreciable variation in the cost of retarder manufacture must be obtained through a variation of the hair content. While a reduction in the quantity of the hair used will correspondingly reduce the cost, it will be seen from Fig. 3 that the strength is also reduced. Therefore the plaster manufacturer is not only interested in the cost of the retarder but also in its strength, or the quantity required per ton of stucco to produce a given setting time. When the product of the cost per pound of retarder and the quantity required per ton of stucco to produce a given setting time is a minimum, it is clear we have a maximum of economy, or, in other words, a retarder of the most economic strength.

Gypsum tile manufacture will be the subject of the next article.

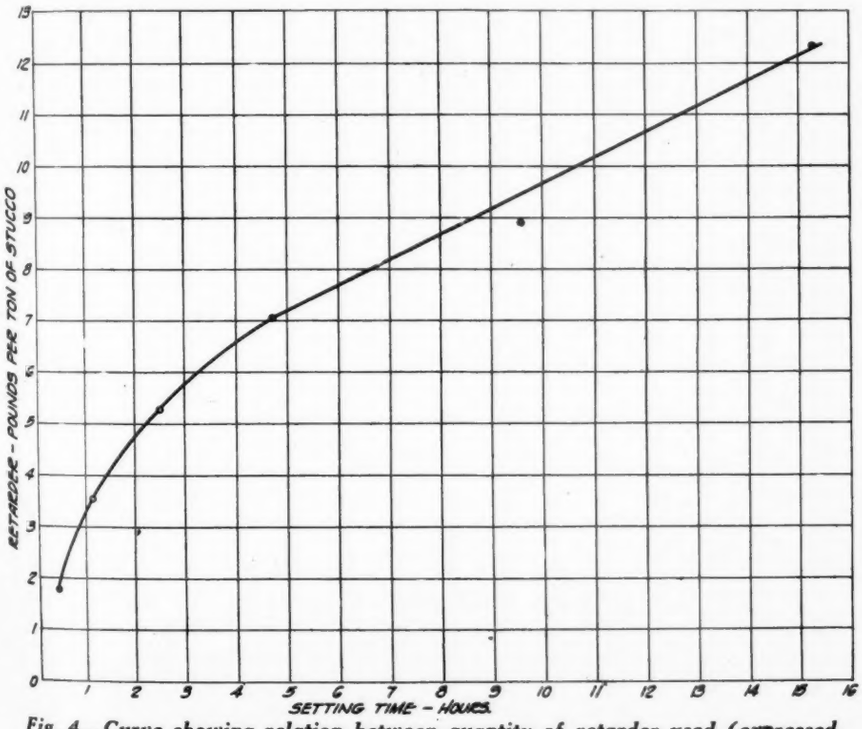


Fig. 4—Curve showing relation between quantity of retarder used (expressed in pounds per ton of gypsum stucco), and setting time of stucco when mixed with 1 part stucco to 2½ parts by weight of sand

Work of Gypsum Committee of the American Society for Testing Materials

ON March 12 and 13 the regular annual spring meeting of Committee C-11 on Gypsum of the American Society for Testing Materials was held at the Bureau of Standards, at Washington, D. C. Representatives of both producers and non-producers were present. A number of interesting reports relative to different phases of work on gypsum were presented which included the following:

"Errors in the Analysis of Gypsum and Gypsum Products," by H. F. Gardner, chemist, Beaver Products Co.

"Comparative Results of the Compressive Strength of Poured-in-Place Gypsum Construction Upon Various Shapes and Sizes of Specimens," by H. E. Brookby, United States Gypsum Co., and H. E. Marks, the H. E. Marks Corp.

"A New Method for Measuring the Consistency of Gypsum Mixes," by H. E. Brookby, United States Gypsum Co.

"The Elasticity of Gypsum Mixes," by L. E. Smith, Bureau of Standards.

"The Effect of Admixtures to Gypsum," J. P. C. Peter, research associate, The Gypsum Industries, Bureau of Standards.

"The Measurement of Plasticity of Gypsum-Sand mixes," by J. P. C. Peter, research associate, The Gypsum Industries, Bureau of Standards.—*Technical News Bulletin, U. S. Bureau of Standards.*

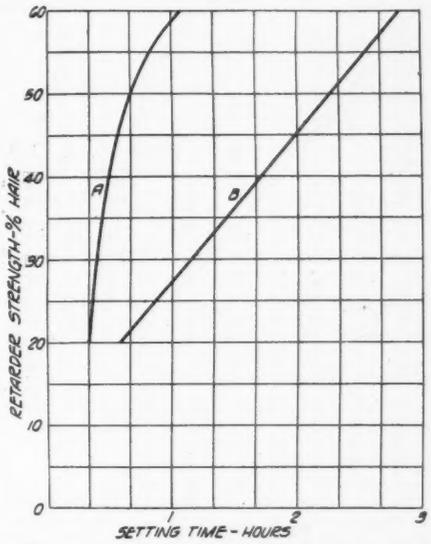


Fig. 3—Curve A is with 3 lb. of retarder, Curve B is with 6 lb. retarder per ton of stucco

Operation of Gypsum Deposits in Australia

THE Department of Commerce in its bulletin on foreign trade contains the following report on gypsum operations in Australia by Julian B. Foster, assistant trade commissioner:

Extensive deposits of gypsum are claimed for Victoria by the official analyst of the Department of Agriculture in that province. It has been tried on a small scale as a soil ameliorant in Victoria for more than 20 years, but its use has not ecome general owing to the small quantity exploited. Two varieties of gypsum said to be of common occurrence in the state are "selenite," and "satin spar." The deposit first operated on a commercial scale is at Boort, Northwestern Victoria, and is in the bed of a dry lake adjoining the railway station and well situated for economic development. It is said to have been worked for more than 25 years and is still yielding gypsum of good quality.

Other fields in active commission exist at Tempy on the Mildura line, Red Cliffs near Mildura, Manangatang and Cowangie, all adjacent to rail and water, which is most important in the gypsum trade, keeping the price of the mineral within the means of the farmer. The above deposists now being worked are superficial and no overburden exists. While the lake or lagoon deposits are the only ones exploited or of importance, beds of gypsum with a foot or two of overburden are said to be common throughout the Mallee, the gypsum content varying from 49.8 to 99.6%.

The Dixie Portland Memorial School

Cement Company Erects a Fitting Memorial to Those Employes Who Died in the War

THE Dixie Portland Cement Co. of Chattanooga, Tenn., has recently erected a school near its plant at Richard City, Tenn., as a war memorial. It is one of the most beautiful schools in the United States, and also one of the most convenient and best equipped. It was the belief of Richard Hardy, the president of the company, that such a school could not completely serve its purpose unless it was beautiful in addition to being a well designed educational "plant."

Walls and building are of concrete tile and floors and the roof are of reinforced concrete. The floors of the portico, lobby and library are of terrazzo, but the other floors are of a specially finished dense concrete. The only wood used is that necessary for the doors and the children's desks.

California stucco was used for the walls and by using different colors and treatment it was possible to make every room distinctive. Especial care was taken with the lighting so that such rooms are restful as well as pleasing. The auditorium has deeply molded panels and ceiling girders of California stucco in various colors and textures and is an exceptionally beautiful room.

Charles E. Bearden of Chattanooga, was the architect and he was advised by Dr. Vessler of the George Peabody school of Nashville, Tenn., as to equipment. The concrete blocks, the trim stone and the California stucco were made by the Dixie Concrete Products Co., a subsidiary company. The building is a memorial to those employes who gave their services to the country in the war.

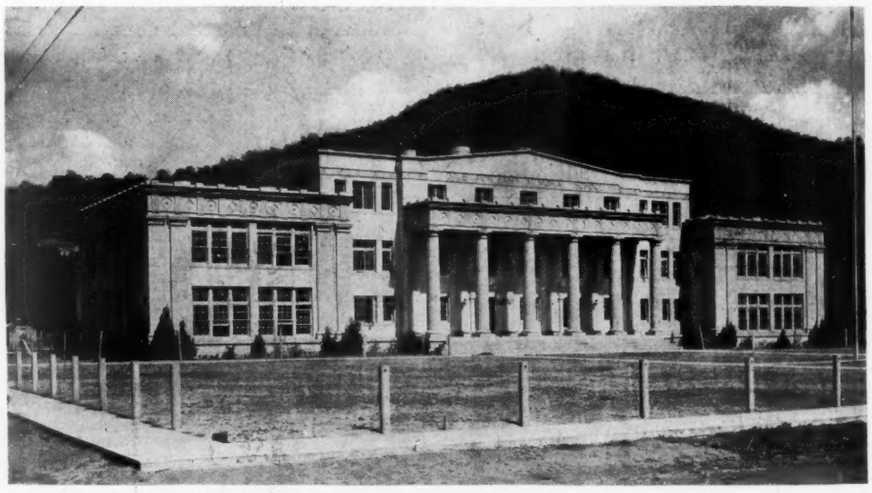
Dixie Doings, the house organ of the Dixie Portland Cement Co., says that the building is "the child and pride" of the president of the company, Richard Hardy, as it well may be. Few, if any, worthier memorials have been erected anywhere.

The Gravel Situation in Louisiana

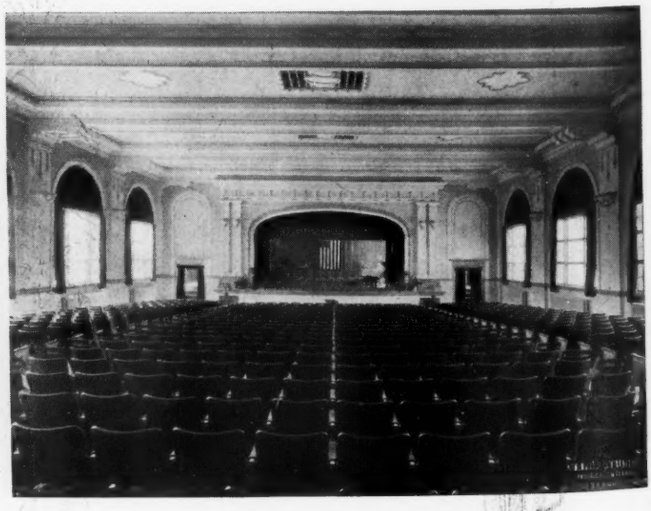
A LETTER to *The Constructor*, in the April issue by Irving R. Pray, executive secretary of the highway and municipal division of the Associated General Contractors, describes a situation in the gravel business in Louisiana which is of interest because the conditions referred to may be duplicated in other states. It reads:

"The secretary, accompanied by the vice-president, recently conferred with Messrs. Irvine and Atkinson of the State Highway Commission and with Mr. Robert, state highway engineer, on the gravel delivery situation. Many complaints regarding the non-delivery of gravel as ordered by contractors have been received. We investigated several cases of this nature and we found that the reasons for this were: first, that some of the gravel companies were bidding in more work than their pits could handle, especially when two or more contractors would ask for gravel at the same time; second, that there had been more gravel used on the west side of the river than all the pits could furnish; and, third, that several of the pits were obliged to open up new territory at about the same time, which takes several days to strip the overburden and to re-locate the screening and loading plants, also that one pit which has been a large shipper was completely exhausted.

"We found that the situation is a bit improved and as remedies for the situation many suggestions were offered both by us and by the commission, among them being



The memorial school built by the Dixie Portland Cement Co.



The library and auditorium shows the care that has been taken to make rooms beautiful and distinctive

that the contractors be allowed damages for all delays caused by the non-delivery of gravel by the gravel people. It was suggested that the contractors bid on all work with them to buy the gravel instead of the commission. This was considered a sure cure for all present evils, but as it would in all probability demand an increased cost of construction it was not considered feasible at this time. The question of the proposals being changed for both the contractors and the gravel men so that the gravel companies should start shipping gravel within thirty days after the award of the contract, and that the contractor must prepare himself to unload and store it; the gravel people to ship at once 30% of the total order at a rate of not over twelve cars per day and the balance of the shipment to come as ordered by the contractor and to be handled by him from cars direct to road bed. This latter solution seemed to meet general approval except that we know from experience that this will not work in many cases where spur conditions and railroad rules are opposed to such storing.

"It was finally decided and agreed upon by all concerned, that this office was to ask for a joint meeting with the gravel people and get their ideas as to the best methods and then we again meet with the commission, so that all parties may work in a spirit of harmony and good feeling which prejudices against none. And in the meantime, the commission agreed to notify and authorize all resident engineers that in case the gravel companies holding contract for projects under their supervision did not ship gravel as ordered and in accordance with the terms of their contracts, that the resident engineers should order from the nearest gravel pit that could supply after giving the owner of contract 24 hours' notice and not ten days more as has been the condition in the past."

Testing Hydrated Lime by Settling*

THE chief test of hydrated lime is the determination of relative particle size which is made by finding the rate of reaction, rate of settling and microscopic examination. The rate of reaction is found by adding 10 c.c. of *N* HCL rapidly to a suspension of hydrate which contained phenolphthalein (indicator) and timing with a decimal stop watch the interval before the reappearance of the pink color. The suspension contained 3.7 grams of hydrate (0.1 equivalent) diluted with water to 10 c.c. and the 10 c.c. dose of acid was repeated 10 times to completely neutralize the lime.

The rate of settling is determined by placing 10 g. of hydrated lime in a 100 c.c. graduate (2.58 c.c. internal diameter) filled to the 100 c.c. mark and shaken well and allowed to settle. Readings are taken every five minutes. Microscopic examination was made in the usual way and the type of cluster noted.

The time to dissolve 80% of the hydrate, the depths of settling in 15 minutes, and the microscopic examination allow substantial conclusions on the properties of the hydrate or hydrates to be drawn. The time required for reaction is a function of the surface area of the hydrate and may be used as an "index" of the size of the individual particles. The data on the rate of settling leads to similar results, but the essential difference is that the settling rate is determined by the size of the particles or agglomerates. Thus a hydrate which consisted of very fine particles would react rapidly with acid, but these particles might be clustered together in lumps which would settle rapidly.

*Abstract from Ind. and Eng. Chem., 18 (1925) 119.

New Prepared Tinted Gypsum Plaster

THE United States Gypsum Co., Chicago, Ill., has developed a colored sand-float finish plaster, called "Plastint." It is a plaster tinted with mineral pigments which assure uniform and permanent color-tone. It requires the addition of water only on the job. It is washable with soap and water without the application of a surface-coat of size. It is made in nine colors—cream, gold, pearl, buff, grey, tan, blue, green, rose—and white.

It is shipped in 80-lb. paper bags. Its coverage is claimed to be 175 to 200 sq. yd. per ton. Because of its all-mineral composition and the even diffusion of pigment obtained by factory-mixing, it eliminates the danger of uneven colors which confront plasterers using job-mixed colored materials.

This material is adaptable to residences, office buildings, apartments, theaters and all other constructions in which it is desired to embody the wall-decoration in the wall-finishing material. It is inexpensive enough to be available for large housing projects and for speculative building developments. It is stocked at the plants of the United States Gypsum Co. at Gypsum, O.; New Brighton and Oakfield, N. Y.; Plasterco, Va.; Ft. Dodge, Ia., and Sweetwater, Tex., and may be obtained with other products of the company in mixed-car lots.

Richard Hardy, president of the Dixie Portland Cement Co.

Causes for Loss of Lime Production

The Ideal Lime Plant and the Personal Equation

By A. S. Deringer
Oak Harbor, Ohio

IN several of the preceding articles in ROCK PRODUCTS I tried to show to those interested that the remedies suggested are a positive cure for the ailments of practically any lime plant.

I am going to "beat you to it" by saying there are other causes for loss of production and other remedies than those enumerated that need to be applied and put into practice. But it is impossible to analyze each particular and peculiar situation in a series of articles and suggest a remedy for your particular trouble and for that of the other fellow.

I have simply tried to show in a general way the causes that are applicable to the majority of plants. It is a well known fact that each operation has its own particular problems as well. Now if we were to summarize all that has been written in the preceding issues of ROCK PRODUCTS on methods for increasing lime production and apply the remedies suggested for all the lime plant ills that have been mentioned, we should come very near to having *an ideal lime plant.*

Lime men are often heard to remark that if ever they had the opportunity and the means to build a lime plant they would have so complete and as convenient a plant as money and ingenuity were capable of building.

They would have the most modern and the best proven type of kilns, with automatic stokers, heat registering devices, shaker grates, ash conveyors, pneumatic or steam operated drawing devices and a conveyor to take the lime direct from the coolers over a bar grizzly to the lime crusher.

They would install an automatic continuous hydrator, and the packing and loading would be so arranged as to require a minimum of labor.

The entire plant would be so designed and constructed as to eliminate as much labor as possible. They would then recline in their office chairs and take in the profits, for a plant so designed and so constructed could not do otherwise than make money.

Now if anyone were to have such a notion and hope thereby to get something for nothing he would be due to get the shock of his life.

He might invest a small fortune in designing and constructing as nearly ideal a plant as money and ingenuity could erect, but he would not be reckoning with the first elements that make even an ideal plant productive to the point of meeting one's expectations.

The Ideal Plant Cannot Make Lime Unless It Is Properly Fed and Operated

The ideal plant of itself will not produce an ounce of lime, and it all depends upon how well he does his part as to the amount and quality of product his ideally constructed plant will produce.

All these innovations and conveniences are absolutely essential in what we today term a modern and ideal plant. But while they reduce the cost of labor in the plant, they will not assure a maximum output unless the kilns are continually filled with the best possible grade of uniform stone, and that the combustion conditions are as ideal as it is possible to make them, so that all the coal that is put into the furnaces will be consumed; that the furnaces always are in the best condition to permit of a constant uniform temperature; that the kilns are properly and evenly drawn at regular intervals.

Now when you take stock of your situation and put into practice the things that you realize are essentials, then you will come very near to having an ideal lime plant, no matter what your equipment may be.

But if you omit the really worthwhile features in the operation of your perfectly constructed plant then your ideally constructed plant will be a disappointment and you had better have had the old fashioned type kiln, hand-operated plant, for you will have some satisfaction when you find results falling below your expectations in thinking that you have an antiquated plant that is costly to operate and not adapted to produce the proper tonnage.

The old fashioned hand-operated plant, operating under conditions that make for maximum production, is more to be desired than the most modern constructed plant operated in a slip-shod haphazard manner.

Cleanliness

The matter of cleanliness and tidyness add a lot to the efficiency of the plant, not only in the way in which the product is produced, but in its general appearance when produced; and it adds considerably to the readiness with which it appeals to the consumer, because a slovenly produced product, regardless of its quality will have its earmarks in all stages of production.

There are few industries in the world today that require more attention to keep the plants from becoming littered and mussed up and from presenting a dilapidated appearance than a lime plant, and unless constant and strict watch is exercised everything in and about the plant will taken on a slovenly appearance.

When you look over some plants and find debris of all sorts scattered about and every nook and corner filled with dust begrimed lime, and everything about the plant unkempt and untidy, you will usually find the workmen with no particular desire to give their best efforts or to produce a fine product in exchange for their daily wage.

It is often repeated that human nature is pretty much the same the world over, that if you insist upon having the plant tidy and orderly you will invariably find the employes responding unconsciously and they will be more painstaking and loyal than if permitted to work in a place where debris and all manner of litter are allowed to render working conditions unfavorable.

Neatness Combined with Safety

If you invite one of your employes who is careless in his appearance, untidy and uncouth in his manners and speech into your office that is spick and span you may note how readily he responds to the surroundings unconsciously on his part. But let that office become disordered and untidy and you will find even a careful, tidy man unconsciously corresponding with the surroundings.

Since it is the pleasantest and most profitable way to operate the plant in a clean, tidy and orderly manner, why not insist on it being so operated and bring your plant one step nearer the ideal plant?

It is generally recognized and accepted as a godsend that the workmen's compensation act as applied in a good many states has lifted a burden from the shoulders of industries.

But it nevertheless devolves upon the employer to exercise care and caution to see that his plant does not offer extra hazardous risks, in order that the rate be kept at a minimum, and that it may not become necessary to penalize the whole industry because of neglecting to keep the plant in proper repair.

The Matter of Repairs

Since no plant or no piece of equipment can perform at its best when in need of repair it behooves the operator to have repairs made speedily and with a view of permanence. It is necessary sometimes when rushed to make temporary repairs, but when these temporary repairs have to be made, do not pass them off as being behind you, but take the first opportunity to do a good permanent job. Nothing adds more to giving a plant a careless and unkempt appearance than to have repairs made in a slip-shod, haphazard fashion, which only tends to become more aggravating as time goes on.

The neglect in making timely and permanent repairs often results in having to renew equipment or parts of a plant that could have been avoided if diligent attention were given when it became obvious that repairs were becoming necessary.

Here again you will find the employe responsive if you insist on keeping your plant and equipment always in good operating condition, as no employe, unless he is utterly void of all sense of justice, will place his own life or that of his co-worker in jeopardy, nor will he hesitate to make necessary repairs permanently, for he dislikes the interruptions in his labors due to improper working of equipment, or whatever it is.

Depreciation

Now in justice to oneself it behooves one to exercise care and not let the plant actually depreciate below the amount that indicates its value. We often find plants and properties depreciating faster in actual operation than they do on paper, due to the fact that some one neglects his duties in not making the proper repairs when they are necessary.

Where the reverse is true you generally find the aim of the operator to be to keep his plant in good operating condition, so that when in the natural course of time when his plant will have been depreciated to the point that it stands charged off (or in other words, has paid for itself), no one will gainsay him the privilege of patting himself on the back because he still has a plant that can duplicate its years of usefulness.

Data Wanted on Machines for Crushing Lime

A CORRESPONDENT asks us to publish the questions which are brought up below. There is reason to believe that a discussion of the subject will be of considerable benefit to the industry, but so far correspondence with crusher manufacturers has not developed any particular encouragement. He writes:

"It has been customary with many lime manufacturers to use hammer mills for reducing lump lime to a 10- or 20-mesh product. It seems that a roll crusher might be used at a considerable saving in power, upkeep, and possibly first cost, and that such an installation would be less troublesome from a dusting standpoint. Should it develop that running through a pair of rolls tends to cake the lime this could be prevented by running one roll faster than the other which would give a sort of tearing action which should make the material loose and granular.

"It is possible that a roll crusher cannot be made to operate successfully, reducing to the fineness desired, but the fact that rolls are used in grinding flour indicates that this objection can be overcome. Roll crusher manufacturers say that a reduction in one operation greater than 4 or 6 to 1 is not practical. Of course, this can be changed by increasing the diameter of the rolls or making the reduction in stages.

"I shall be very glad to learn whether any lime manufacturer has ever tried out a double roll crusher for this purpose and if so what success was had. Any experience along this line which can be brought to light will be greatly appreciated."

The editors invite experience in lime crushing. There are so many machines which might be used for the purpose it is surprising not more kinds are used. The "differential" roll mentioned is used for crushing fullers earth.

Strength of Masonry at Early Ages*

A SERIES of tests was recently completed at the Rock Island Arsenal on the strength of wall specimens laid up in lime mortar. These tests, which were made by P. C. Cunnick, director of the laboratories there, were conducted at the ages of 1, 2, 3, 4, 5, 6, 7 and 28 days on specimens 8 in. thick, 16 in. long (4 headers) and 36 in. high (13 courses), and supplementary tests were also made on two and three brick specimens. The data secured is most interesting. All specimens were laid up with ⅜-in. mortar joints, all joints full, by the arsenal bricklayers and represent good average practice. Clay brick, classed as "hard" under the A. S. T. M. requirements, were used throughout. Three types of 1:3 mortar were used.

In one group of tests the mortar was made from hydrated lime and sand mixed just before use, as might frequently be the case in the field. The other two mortars were made from lime putty and sand, the difference being that in one group the putty had been allowed to age for three days and in the other the ageing period was 14 days. All materials were obtained on the open market.

In order to determine how much settlement would occur under loads at these early ages a series of readings were taken on each specimen, the measurements being taken to 1/1000 of an inch and the loads which produced these deflections noted.

It was noted that even at the age of 1 day it would require far greater loads than could be imposed on a wall to produce a settlement which could be noted. For quick computations, it is safe to say that each foot of wall produces a load of 1 lb. per sq. in.

Tests of the shear strength of specimens laid up in these several mortars were also made. The specimens consisted of three bricks bonded together with two ordinary mortar joints. They were tested in the vertical position with the two outer brick supported on knife edges 3½ in. apart and the load applied to the center brick through a spherical bearing block as specified by the A.S.T.M.

In these tests, as in the compression tests, the strength of the specimen increased with age, but even at the very early ages sufficient strength is developed to resist all ordinary forces.

Table I shows that at the age of one month these "wallettes" have a compressive resistance of nearly 800 lb. per sq. in. Some time ago the U. S. Bureau of Standards ran a series of compressive strength tests on sand-lime brick walls, using both large sized specimens and "wallettes." These tests are reported in Technologic Paper 276, "Compressive Strength of Sand-Lime Brick Walls." The investigators found that the strength of the large specimens was from 60 to 80% of that of the small specimens or "wallettes."

TABLE I.—28-DAY STRENGTH OF WALLETTES

1:3 mortar made from	Average* Maximum load lb.	Average* Maximum Strens. lb. per sq. in
Hydrate, not aged	102,000	793
Lime putty, aged 14 days	103,250	778
Lime putty, aged 3 days	65,750	514

*Average based on results from 6 specimens.

On this basis it will be seen that the factor of safety of masonry laid up in lime mortar is high. Under ordinary conditions the U. S. Building Code Committee in their report on Minimum Requirements for Masonry Wall Construction, permits a loading of 90 lb. per sq. in. when 1:3 lime mortar is used. Assuming that the loading equals this figure, which actually is rarely reached, the factory of safety as calculated from the 28-day results here presented may be taken as 6 when 14-day putty or hydrate is used, or 4 when putty has been aged only 3 days.

Where high and concentrated loads are encountered cement may be aded to lime mortar. Such a practice will increase the strength of the mortar, although it also increases both the labor and material costs. These factors should all be taken into consideration when specifying types of mortar. Mortar should be specified with due regard to the load which it must carry.

*Abstract of paper presented by J. S. Elwell, National Lime Association, before the Building Officials' Conference, Columbus, Ohio.

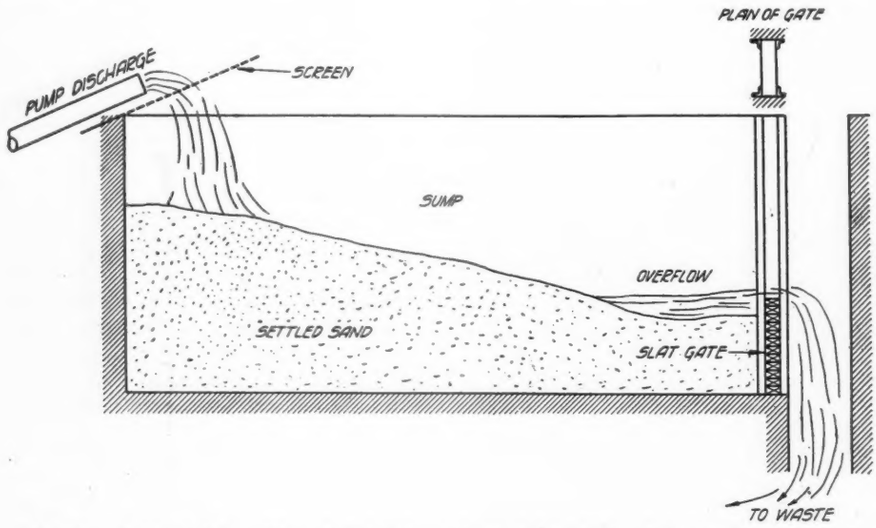
Hints and Helps for Superintendents

Sumps with Slat Gates Used for Collecting and Washing Sand

AT many sand plants on the Arkansas river sand is pumped into a sump by a dredge. The sand is afterward dug out by a clamshell bucket, operated through a derrick or a crane, and loaded into cars or on to a stock pile.

The sump is sometimes only a hole in the ground and sometimes it is a well designed arrangement which not only catches the sand but washes it free from fine sand and mud and trash. In this case it becomes a real classifier operating by what is known in the kindred art of ore dressing as "buddling." The method has been used for generations for washing tin ore in Cornwall, for example.

The essential part of the device is the slat gate by which the height of the overflow is regulated. This gate consists of a frame into which slats (which are usually pieces of 2x4-in. timber) are placed as the sump fills up so as to keep the level of the overflow at the same height in relation to the sand in the sump.



Section through the settler showing how the height of the slat gate is regulated so that trash, mud balls and fines are washed from the settled sand

The cuts show the gates in two sumps. One is a large sump which has been partly dug out by the clamshell. The other is a small sump (16x28 ft. inside) and is shown just as it was left after being filled by the dredge. Both sumps are made of concrete. In the large sump the slat gate is in a partition which has been placed across one corner; in the small sump the gate is at the end across a vertical chute down which the overflow falls. The slats in this case are placed in slots cast in the concrete. The sketch shows how the sump with the slat gate works when it is used to wash and classify the sand. The slat gate is built up as the sand settles but it is kept low enough so that the greater part of the sand is out of water. The water flows over the surface of this exposed sand washing off trash, such as leaves and branches and the fine sand. The coarse sand is too heavy to wash so it stays behind and builds up in the sump.

The sand is roughly classified, the coarser sand remaining at the end nearer the discharge. This is sometimes convenient as the lower end may be dug out for plastering sand. Where a uniform sand is wanted the sump may be excavated by the clamshell so as to mix the sand from the different parts in a stockpile.

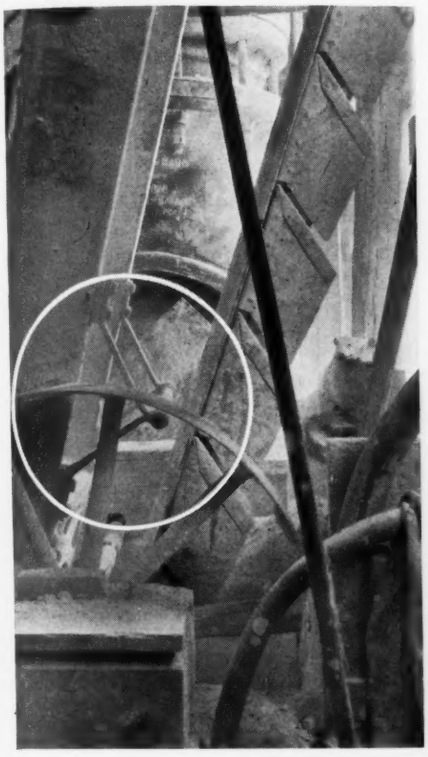
Placing a Crusher in a Tight Place

IN adding a reduction crusher to their plant near East St. Louis, Ill., the East St. Louis Stone Co. was faced with the problem of making extensive changes in the existing plant, or of placing the crusher about as close to existing equipment as was physically possible. Indeed, the fit was so snug that only on the guarantee of W. J. Cavanaugh, sales representative of the Kennedy-Van Saun Manufacturing and Engineering Co., that he could do it, was the installation made.

The original crushing plant consisted of a

Left—A slat gate placed in an angle of a large sump. The picture was taken after the sump had been partly excavated. Right—The slat gate applied to a smaller sump. The slats go into a slot which does not show well in the photograph

No. 6 Gates gyratory crusher and a 4x16-ft. rotary sizing screen, with rejections returned by a gravity chute to the primary crusher. It was desired to increase the capacity of the plant to make small stone, without rebuilding, and the space to house the Kennedy No. 37 gearless was so small that it had to be placed almost in contact with the belt-



Baffle brackets show in the circle

bucket elevator, which carries the crushed stone from both crushers to the sizing screen.

To keep the stone from bounding out into the elevator pulley, a baffle in front of the crusher opening was necessary, and the rather unique method of holding this baffle in place, by brackets on the elevator frame is illustrated herewith. It was necessary to tap the return chute and bring it through the elevator (at a point above that shown in the view) to feed the re-crusher, which has a motor on the eccentric shaft, below—a self-contained crushing unit.

Cement Company Plants Trees in Its Quarry Floor

A WORKED out quarry is often an unsightly thing and a method which will turn it from an eyesore to a thing of beauty ought to be welcome to the industry. The Southwestern Portland Cement Co. has succeeded in solving the problem of what to do with a worked out quarry by planting the quarry floor with trees in its El Paso plant.

This might not be possible in every case, as the rock in the floor would not always be such that trees could be grown in it. But this is a cement rock quarry from which both lime and shale have been taken. The mixture required only 1% of added limestone to bring it to the proper proportions for cement making. Such a mixture of rocks rapidly disintegrates to a soil in which trees may be grown, if it is broken fine enough.

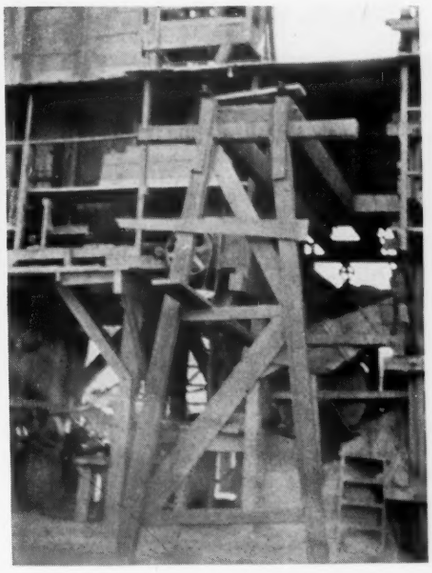
The tree planting was begun while quarrying was still going on, the trees being kept far enough from the face to insure that they would not be damaged.

As El Paso has a scanty rainfall, the trees have to be irrigated and the water pipes shown in the picture are for irrigation water.

A Home Made Crane to Go Above a Crusher

By N. F. JONES
Supt. Atlas Rock Co., Stockton, Calif.

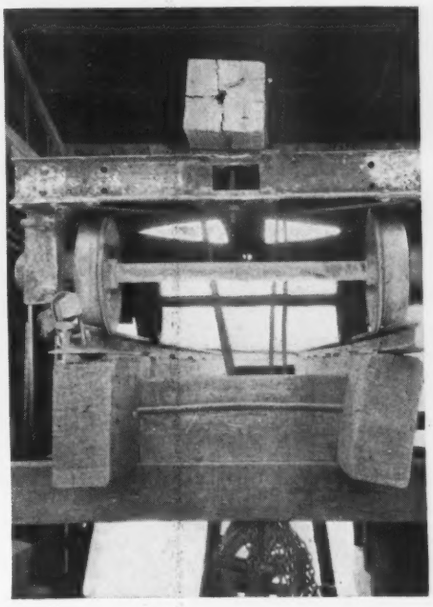
AN expensive piece of equipment which is used very few times in a season, is the overhead carrier above the crushers.



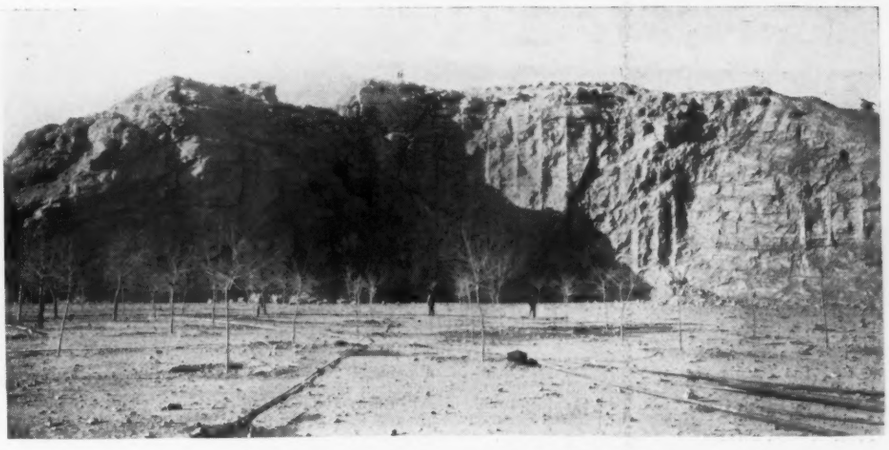
Heavy wood frame which supports the timbers on which the car body with its chain block rides

This is more noticeable in a plant where the crushing is about 20 or 30% of the output, as crusher repairs are few and far between. Enough old material is usually available to make a very serviceable carrier which will avoid the expense of purchasing one. Two 7x16 bridge stringers, placed above the crushers, take the place of the customary steel beams. An old car frame, any gauge, makes the carrier. A piece of solid timber, large enough to hold the weight of the piece to be lifted, is bolted lengthwise in the center of car frame. To this timber may be suspended as many chain blocks as required to make the lift. In plants having loading chutes outside of bunkers, as in this photograph, the outside ends of 7x16 are supported on a frame high enough to clear tracks.

By this method, whenever a heavy repair is to be made, the new parts are loaded in a car and placed under the chain blocks. The old ones are then taken out, placed in the same car, the new ones picked up and put in place. The arrangement in this picture is serving both a jaw and disc crusher, and has given as good service as the more expensive steel beam type.



The car body has a cross timber to which the chain blocks are attached



Quarry floor made into a park by planting trees

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co. (common)[2]	May 11	100	120	123	1¾% quar. 25% ex. Dec. 1
Alpha Portland Cement Co. (preferred)[2]	May 11	100	114	.....	1½% quar. Sept. 1
Arundel Corporation (sand and gravel—new stock)	May 8	No par	32	32	30c quar.., Apr. 1
Atlas Portland Cement Co. (common)[2]	May 11	No par	47	49	50c quar.
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	May 11	33⅓	43	46	2% quar. Oct. 1
Bessemer Limestone and Cement Co. (common)[4]	May 8	100	135	142	1½% quar. Jan. 1, 4% ex. Jan. 1
Bessemer Limestone and Cement Co. (preferred)[4]	May 8	100	106	108	1¾% quar. Jan. 1
Bessemer Limestone and Cement Co. (convertible 8% notes)[4]	May 8	.....	115	130	8% annual
Boston Sand and Gravel Co. (common)[10]	May 7	100	65	75	2% quar. July 1
Boston Sand and Gravel Co. (preferred)[10]	Apr. 8	.....	.....	75	1¾% quar. Oct. 1
Boston Sand and Gravel Co. (1st preferred)[10]	Apr. 8	.....	.....	85	2% quar. Oct. 1
Canada Cement Co., Ltd. (common)	May 11	100	100⅛	100¼	1½% quar. Apr. 16
Canada Cement Co., Ltd. (preferred)[11]	May 7	100	112¼	113¼	1¾% quar. May 15
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	May 7	.....	102	103	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	May 7	100	92	95	
Charles Warner Co. (lime, crushed stone, sand and gravel)	May 7	No par	22	24	50c quar. Apr. 12
Charles Warner Co. (preferred)	May 7	100	100	102	1¾% quar. Apr. 22
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	May 7	100	103	105	
Cleveland Stone Co.	May 12	.....	162	165	1½% quar., Mar. 1, 1% ex. Mar. 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	May 7	100	103½	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	May 12	.....	96½	97½	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	May 12	100	98½	99½	
Dexter Portland Cement Co. (6% serial bonds, 1935)[23]	May 10	.....	99	101	
Dolese and Shepard Co. (crushed stone)[7]	May 12	50	84	86	$1.50 quar. Apr. 1
Giant Portland Cement Co. (common)[2]	May 11	50	33	38	
Giant Portland Cement Co. (preferred)[25]	May 7	50	45½	47	3½%s.-a. Dec. 15, plus 10% arrears
Ideal Cement Co. (common)	May 11	No par	72	78	$1 quar. Jan. 2. 50c ex. Dec. 27
Ideal Cement Co. (preferred)[6]	May 8	100	107	110	1¾% quar. Jan. 2
International Cement Corporation (common)	May 12	No par	55¼	56⅜	$1 quar. Mar. 31
International Cement Corporation (preferred)[2]	May 12	100	103⅜	103⅜	1¾% quar. Mar. 31
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Kelley Island Lime and Transport Co.	May 12	100	120	121	$2 quar. Apr. 1
Lawrence Portland Cement Co.[2]	May 11	100	110	.....	2% quar.
Lehigh Portland Cement Co.[6]	May 8	50	87	90	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, expire serially up to 1930)[13]	May 7	100	99	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, expire serially from 1930 to 1935)[13]	May 7	100	97	99	
Michigan Limestone and Chemical Co. (common)[6]	May 8	.....	25	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	May 8	.....	24	.....	1¾% quar. Apr. 15
Missouri Portland Cement Co.	May 11	25	55	56	50c quar. Apr. 30
Monolith Portland Cement Co. (common)[9]	May 7	.....	10¾	11¼	
Monolith Portland Cement Co. (units)[9]	May 7	.....	26¾	28¼	
Monolith Portland Cement Co. (preferred)[9]	May 7	.....	8	8¼	
Nazareth Cement Co.[26]	May 7	No par	37	39	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	May 7	.....	120	.....	
New Egyptian Portland Cement Co. (preferred) with common stock purchase warrants[21]	May 7	100	99	101	
New England Lime Co. (Series A, preferred)[14]	Jan. 29	100	96½	99	
New England Lime Co. (Series B, preferred)[22]	May 7	100	92	95	
New England Lime Co. (V.T.C.)[22]	May 7	.....	35	38	
New England Lime Co. (6s, 1935)[14]	May 8	100	99	100	
North American Cement Corp. 6½s 1940 (with warrants)	May 11	.....	98	98	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Apr. 8	.....	94	99	2 mo. period at rate of 7%
North American Cement Corp. (preferred)	Dec. 31	.....	.....	.....	1.75 quar. May 1
Pacific Portland Cement Co., Consolidated[5]	Apr. 24	100	91	92	½% mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Apr. 24	.....	100	100¼	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	May 7	10	5¾	6⅛	
Petoskey Portland Cement Co.[1]	May 7	10	9½	10¼	1½% quar.
Rockland and Rockport Lime Corp. (1st preferred)[10]	Apr. 8	100	98	98	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Apr. 8	100	.....	70	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[10]	Apr. 8	No par	.....	50	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	May 12	100	124	135	$2 quar. Apr. 1
Santa Cruz Portland Cement Co. (bonds)[5]	May 7	.....	106	.....	6% annual
Santa Cruz Portland Cement Co. (common)[5]	May 7	50	.....	90	$1 quar. $1 ex. Dec. 24
Superior Portland Cement, Inc. (new stock)[20]	May 7	.....	.....	43½	
United States Gypsum Co. (common)	May 11	20	136	136	2% quar. Mar. 31
United States Gypsum Co. (preferred)	May 11	100	114	115	1¾% quar. Mar. 31
Universal Gypsum Co. (common)[3]	May 12	No par	16½	17	
Universal Gypsum V.T.C.[3]	May 12	No par	16	16½	
Universal Gypsum Co. (preferred)[3]	Aug. 5	.....	76	.....	1¾% quar. Sept. 15
Universal Gypsum Co. (1st Mortgage 7% bonds)[3]	May 12	.....	99	(at 6½%)	
Union Rock Co. (7% serial gold bonds)[18]	May 7	100	99	101	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	May 12	100	98½	100	
Wolverine Portland Cement Co.	May 11	10	6	7	2% quar. Aug. 15

[1]Quotations by Watling, Lerchen & Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by De Fremery & Co., San Francisco, Calif. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston, Mass. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25] A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn.

QUOTATIONS ON INACTIVE ROCK PRODUCTS CORPORATION SECURITIES ON PAGE 80

Editorial Comment

The Water-Cement Specification

The new building of the Portland Cement Association is made of concrete for which only the water-cement ratio was specified, the contractor being allowed to use what aggregate he pleased within wide limits. Producers will want to know what effect the universal adoption of such a specification for concrete will have on the mineral aggregate industry. Rock Products cannot see that the effect will be in any way harmful. The contractor will want to buy the aggregate that will give the highest degree of workability for the water cement-ratio specified. This will be that aggregate which has the highest fineness modulus within the prescribed limit for the sizes used. So he will buy and combine his aggregates according to the principles which have always been accepted for making scientific concrete. Less water will be needed for a well graded aggregate to give the required workability, and since the water-cement ratio is fixed, less water means less cement. If it has any effect at all, the new specification should put a premium on well graded aggregate, well graded meaning that aggregate which has the highest fineness modulus within the prescribed limit.

Of course the qualifications of structural soundness, cleanliness and freedom from deleterious substances, either organic or inorganic, remain of the same importance that they always have had. These are the fundamental characteristics of a good mineral aggregate and lacking any of these the aggregate is deficient and only an inferior concrete can be made from it no matter what theory of mixing is followed.

Screen Efficiency

While a Rock Products editor was being shown around a crushing plant, the manager pointed to two vibrating screens of standard make and remarked that it was curious how well the screens were working in that place because in the old plant they were found "inefficient." The probability is that the screens did just as much screening in the old plant as in the new, but they were fed with too large a tonnage or else the feed contained so many particles of the sizes near the screen opening that the effect was the same.

Judging a screen by what the manager or foreman *thinks* it ought to put through, is poor business, and yet this is commonly the way that screens are judged. A screen is bought to go in a certain place in the plant and if it fills that place it is judged efficient. If it does not it is judged inefficient and condemned, even though it has been asked to do the work for which two screens should have been purchased. There are differences in screens, of course; that is, certain types have a greater capacity per square foot of screening surface than others. Other types have advantages in not blinding easily and in freedom from frequent repairs. One may be quite ready to put up with a lower capacity for the sake of the other advantages. But to do this and then condemn the screen as inefficient shows a lack of understanding of the elementary principles of screening.

Demands of Building Trades

Newspapers say that about $200,000,000 worth of construction planned for Chicago is being held up until labor disputes are settled. The same authority says that if the various building trades win what they ask for the cost of building in the Chicago district for the year will be increased about $30,000,000. All of this, it will be noted, goes to the labor employed in placing building materials and none of it to the labor employed in producing them.

Regardless of labor disputes, construction is still going on at a rate equal to that of 1925 and all investigators predict that this will continue throughout the year, according to a report from one of the largest New York banks.

Installment Buying

Nervous people have been badly worried by the great increase in installment buying in the United States. They feel that people are tempted in this way to buy more than they can pay for and think that the end will be a spectacular smash up, with everyone refusing to meet his installment payments and retailers, wholesalers and manufacturers being successively forced into bankruptcy.

The American Bankers Association has investigated installment buying and its report should be soothing. Its investigators found that installment buying by the wage earning and salaried class affected only about 3% of all the business done in the United States, a proportion too small to seriously affect the course of business. They also found that installment paper was an excellent form of security, from the banking point of view, as it was not only well secured, but amortized rapidly. Apparently bankers have no fear of calamity arising from installment sales, and if this is true, the rest of us have no reason to worry.

It is well for producers to recognize this, for no business is more sensitive to psychological influences than construction. Anything that appears to indicate a set-back in general business conditions is apt to cause the class of investors who put money into new construction to become over-cautious. The laying of the installment ghost by a cold-blooded banking report should have an excellent psychological effect.

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Divided rate
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (1)	Dec. 30	.....	70	.....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (1)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)	Nov. 3	50	7½c(x)	.....	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (1)	Mar. 17	.....	$12 for the lot	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
Lime and Stone Products Co. (1100 sh. pfd., $10 par and 700 sh. com., $10 par)	Feb. 10	.....	$66 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼ % semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1⅝	
Phosphate Mining Co. (1)	Nov. 25	.....	1@5	.....	
Pittsfield Lime and Stone Co. (preferred)	.....	100	.....	.....	2% quar. Apr. 1
Rock Plaster Corp. (390 sh. com., no par) (1)	Mar. 17	.....	$12 for the lot	.....	
Simbroco Stone Co. (pfd.)	Dec. 12	.....	.....	.....	$2 Jan. 1
Tidewater Portland Cement Co. (common) (3)	Nov. 25	.....	8½	.....	
Vermont Milling Products Co. (slate granules) 5 sh. pfd. and 1 sh. com. (2)	Dec. 30	.....	$1 for the lot	.....	
Winchester Brick Co. (preferred) (sand lime brick) (5)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925.

Nazareth Cement Company Earnings

The figures below are a condensed form of the balance sheet and comparative yearly earning record of the Nazareth Cement Co., Nazareth, Penn., as prepared by Ernst and Ernst, Boston, Mass.:

COMPARATIVE EARNINGS FOR PAST THREE YEARS ENDED DEMEBER 31, 1925

	1925	1924	1923
Gross sales	$2,906,104	$2,716,158	$2,647,989
Net profit	891,006	972,891	948,188
Bond interest	0	41	11,812
Balance	$ 891,006	$ 972,850	$ 936,376
Depreciation and depletion	163,052	155,597	137,595
Balance	$ 727,954	$ 817,253	$ 798,781
*Provision for federal taxes	98,273	110,329	107,835
Net profit available for dividends	$ 629,681	$ 706,924	$ 690,946

*Based on proposed new rate of 13½%.

BALANCE SHEET AS OF DECEMBER 31, 1925
(Prepared by Messrs. Ernst & Ernst, Boston, Mass.)

Assets	
Current:	
Cash	$ 713,350.69
Notes and trade acceptances receivable	29,808.12
Accounts receivable	316,051.85
Inventories	459,787.88
Marketable securities	17,000.00
Investment in subsidiary company (estimated fair value)	150,000.00
Other Assets:	
Sundry investments (estimated fair value)	43,050.00
Miscellaneous notes and accounts receivable	4,403.92
Permanent:	
Quarry lands, plant, equipment, real estate, machinery, etc.	5,446,054.09
Less: Allowance for depletion and depreciation	1,079,639.42
Trade mark and good will	1.00
Deferred charges	31,406.24
Total assets	$6,131,274.37
Liabilities	
Current:	
Accounts payable	$ 186,887.04
Accrued wages, commissions and provision for estimated federal income tax—year 1925	66,847.48
Bonded Indebtedness:	
First refunding mortgage 6's, 1948, authorized	1,000,000.00
Less: Unissued and retired $300,000.00	
In treasury 700,000.00	1,000,000.00
Capital Stock:	
Preferred, authorized $750,000.00	
Less: In treasury 63,100.00	686,900.00
Common, authorized $750,000.00	
Less: In treasury 35,190.00	714,810.00
Current liabilties	$ 253,734.52
Capital stock	1,401,710.00
Surplus	4,475,829.85
Total	$6,131,274.37

Note: The company was contingently liable as accommodation endorser of notes receivable acquired and subsequently discounted, the proceeds of which were crediteed to a subsidiary company in the amounts of $21,238.24, including interest accrued.

As shown by the above figures the net earnings of the company applicable to dividends and after federal taxes, have averaged $675,850, or at the rate of over $4.29 per share on the new capital stock of the company. It is estimated that the earnings of the company for 1926 will be considerably in excess of the average for the last three years.

In addition the company has in recent years purchased out of earnings $785,000 of its own bonds, of which $85,000 have been retired and the remainder placed in the treasury.

In view of the earnings shown above and the outlook for the future, the directors have indicated their intention of inaugurating dividends on the new stock at the rate of $3 per annum.

Dividends—The dividend record of the two classes of old stock has been as follows:

DIVIDENDS PAID (1918-25)—NAZARETH CEMENT CO.

	1925	1924	1923	1922	1921	1920	1919	1918
Preferred	35%	20%	20%	†10%	7%	7%	7%	7%
Common	35%	20%	20%	†10%	7%	7%	7%	0

†Also 60% in stock.

Indiana Limestone Bonds Offered

THE Bankers Trust Co., Otis and Co., Cleveland Trust Co., Illinois Merchants Trust Co., Second Ward Securities Co., First National Co. of Detroit, Fletcher American Co. and Whiting and Co. are offering at 99 and accrued interest, $5,000,000 first mortgage 6% 15-year sinking fund bonds of the Indiana Limestone Co.

This is the first financing of the Indiana Limestone Co., which was recently organized as a combination of 24 quarry properties in the Bedford-Bloomington district. (ROCK PRODUCTS, April 17 issue). The following is from a letter by A. E. Dickinson, president of the company:

The company holdings consist of 1652 acres owned in fee and 40 acres under lease in the Bedford-Bloomington district and which produces three-fourths of all the Indiana limestone used in this country.

A consolidated balance of the companies included in the combination reveals net tangible assets of $46,426,669. The total capitalization upon completion of the present financing will consist of $20,000,000 funded debt, $5,000,000 of 7% sinking fund debentures, $5,000,000 of 7% cumulative preferred stock and 1,500,000 shares of no par common stock.

Net earnings of the constituent companies for the three years to December 31, 1925, averaged $3,504,747 annually, equivalent to 3.89 times the maximum interest requirements on the bonds. A sinking fund is provided, which upon the basis of shipments and earnings at the present rate should retire approximately two-thirds of the bonds by maturity.

International Cement Annual Report

THE annual report of the International Cement Corp. shows that 1925 was the best year in the history of the company. Net profit was $4,638,000 as compared with $3,371,397 in 1924 and the surplus balance after interest, federal taxes and dividends paid was $1,718,463. The following is a comparative statement for the years 1922 to 1925, inclusive:

INTERNATIONAL CEMENT CORP. COMPARATIVE STATEMENTS FOR 1922-1925, INCLUSIVE

	1925	1924	1923	1922
Sales, less discounts, etc.	$17,713,900	$13,683,504	$11,289,117	$9,407,725
Manufacturing and shipping costs	10,021,390	7,843,273	6,382,770	5,739,578
Provision for depreciation and depletion	1,154,627	697,987	822,074	927,146
Selling, administration and general expenses	2,064,055	1,505,852	1,214,104	1,047,372
Net profit from operations	$4,473,827	$3,636,391	$2,870,169	$1,693,629
Miscellaneous income	164,994	135,006	102,261	168,451
Total income	$4,638,821	$3,771,397	$2,972,430	$1,862,080
Interest, taxes and miscellaneous	662,436	723,890	549,853	437,033
Preferred dividends (7%)	457,922	193,591	103,351	107,016
Common dividends	1,800,000	1,476,006	1,164,537	850,633
Balance, surplus	$1,718,463	$1,377,910	$1,154,689	$467,398

Southwestern Crushed Stone Producers Plan Educational Campaign

TO SUPPLEMENT the announcement in the previous issue of the formation of the Southwest division of the National Crushed Stone Association, E. C. Dodson, temporary president of the division, has written us the following about the aims and purposes of the organization:

Col. E. C. Dodson, president, Midwest division of N. C. S. A.

"Conceding that cement be first considered when concrete construction is anticipated, our thought is that crushed rock or gravel aggregate is of next importance, we feel that this consideration can be best brought about in the same manner cement interests have popularized the use of concrete construction, and therefore the use of their product. To this end it was thought expedient to organize the Southwest division of the National Crushed Stone Association, the organization of which was consummated April 14 at Austin, Texas, who elected officers and employed a competent engineer to take up the work indicated for the purpose of carrying on aggressively and persistently a campaign of education as to the relative value of crushed rock aggregate as compared with other materials employed in concrete construction.

"To carry out this plan our association has engaged the services of R. J. Hank, formerly Texas state highway engineer, to act in the capacity of manager of the combined crushed aggregate interests, whose object is to promote the use of crushed aggregate in highway and concrete construction generally.

"We intend to direct our activities to calling architects and engineers' attention to the fact that crushed aggregate is of greatest value in concrete construction, inasmuch as it compares with good warp in cloth, which is generally known to be most important.

"Our plan will also include disseminating information as to the relative value of crushed aggregate so that the laymen may understand what really should be employed in good concrete in addition to cement."

Announce Winners of National Safety Contest

EXTRAORDINARY records of large industrial production with no loss of time occasioned by accidents were revealed in connection with the announcement made recently by Secretary Hoover of the Department of Commerce, of the names of mines and quarries adjudged winners of the national safety competition held under the auspices of the Bureau of Mines, for the bronze trophy "Sentinels of Safety," donated by the *Explosives Engineer* magazine, and which was described in detail in Rock Products, February 6 issue. A Maryland quarry operated 350 days and worked 202,663 man hours during 1925 with no loss of time from accidents. Four other quarries, located in Indiana, Tennessee, New York and California, also operated with no loss of time due to personal injuries.

Bronze safety trophy awarded for best records in quarry accident prevention

Nearly 300 of the larger mines and quarries participated in the competition, the contestants being divided into five groups: anthracite mines, bituminous coal mines, metal mines, mines producing non-metallic minerals and quarries or open pit mines. A replica of the trophy is awarded to the mining operation in each group sustaining the smallest loss of time from accidents in proportion to total time worked during the year. Determination of the winners was made by a jury of award comprised of officials of various mining and quarrying associations, the National Safety Council and the American Federation of Labor, based on a tabulation of mine accident data prepared by the Bureau of Mines. A feature of the competition is the awarding of a certificate of honor, signed by the director of the Bureau of Mines, to every employe of each of the winning mines and quarries.

R. J. Hank, manager, Midwest division of N. C. S. A.

In the group of underground mines producing non-metallic minerals, the trophy was awarded to the Lower gypsum mine of the United States Gypsum Co. at Gypsum, Ohio. Honorable mention was accorded the Ironton underground limestone quarry, operated by the Alpha Portland Cement Co., Ironton, Ohio; the Crystal City sand mine of the Pittsburgh Plate Glass Co. at Crystal City, Mo.; the limestone underground quarry of the Alpha Portland Cement Co. at Milltown, Ind., and the Bell underground high calcium limestone quarry of the American Lime and Stone Co. at Bellefonte, Penn.

In the quarry and open pit mine group, the winner is the Security quarry of the North American Cement Corp. at Security, Md. Honorable mention was accorded the cement rock quarry of the Louisville Cement Co. at Speed, Ind.; the limestone quarry of the Dixie Portland Cement Co. at Richard City, Tenn.; the Cementon quarry of the Alpha Portland Cement Co. at Cementon, N. Y., and the andesite quarry operated by the city of Los Angeles harbor department on Catalina Island, Calif.

New York City Sand and Gravel Dealers Organize to Cure Trade Abuses

By ALLEN E. BEALS
In Dow Service Daily Building Reports

ORGANIZING under the name of the Greater New York Sand and Gravel Dealers Protective Association, Inc., for the purpose of presenting a united front against abuses, corruption and reprehensible trade practices that have crept into the sand and gravel section of the building construction industry of this city, articles of incorporation have just been filed at Albany by Weschler and Weschler, attorneys.

The articles of the new organization as approved by Justice Norman S. Dike of the Supreme court vigorously set forth that the association was formed for the purpose of "fostering trade and commerce in sand, gravel, ashes, broken stone and cement; to reform abuses in the trade; to diffuse accurate and reliable information as to the standing of merchants and other matters of importance or interest to the trade; to procure uniformity and certainty in the customs and usages of the trade; to appoint an arbitration committee or board for the purpose of adjusting differences or disputes among people engaged in the said trade and their customers or others, and to promote a more enlarged and friendly intercourse between business men engaged in the sand, gravel, ashes, broken stone and cement business."

Since the mass meeting of the building trades, called by *The Dow Service Daily Building Reports* in the Engineering Societies building on December 15, when the mirror was held up to the building trades of New York and vicinity to enable it to see itself in the unethical role it has essayed during the period of reckless competition for volume to the utter disregard practically of quality or good business practice, two branches of the industry have completed organization, but many more are soon to follow.

These organizations have been effected for purely self preservation purposes and with the turn in economics pertaining to the building business now not far away, the interest in the matter of purifying, stabilizing and putting the various parts of the current building business on a better merchandising basis promises swift and sure correction.

The public in general has no small interest itself in these curative efforts because its general safety and welfare, not only physically but financially, is very much at stake.

No one recognizes this better than those dealing in building materials. It was in effect recognized by the Portland Cement Association when it conducted its recent short course for the proper mixing of concrete aggregates. It was likewise recognized by the structural steel contractors when they insisted upon cutting out the element of gambling and guesswork in estimating on steel for buildings without the aid of completed plans drawn by persons competent to prepare them. It also was recognized by the masons' material dealers when they organized an association founded upon the same high ethics as expounded in the articles of incorporation filed by the sand, gravel and ash, cement and stone dealers, at present of Brooklyn, but later of all the city.

Another powerful accelerator toward reform in construction business practice is the increasing attention being paid to it by those putting money into building operations. Investment enterprises of today are not being given over so freely to builders of abbreviated standing. There is no way to ascertain how many hundreds of thousands of dollars were spent in this city during the life of buildings now nearing completion, paid at terrific premiums to firms other than those that originally took the contracts to insure their completion in time for the 1926 spring renting season, but the penalty paid is enormous.

When reputable builders come into the market for dependable sub-contractors and award contracts to them, these men demand service of a high order from the material distributors, and when competition for their favor develops from sources where business standards are not as highly developed as they are in other lines these who plainly foresee the results of a dominance of recent trade standards and practices are taking resolute steps to see that it does not rise.

George A. Colgan, Jr., secretary and treasurer of the Hygrade Builders Supply Co., Inc., is president of this new sand and gravel protective association. William E. Code, president of the Hunterspoint Lumber and Supply Co. of Long Island City, is vice-president; Dennis Mahoney of Mahoney and Busch, Brooklyn, is secretary, and Joseph J. Ryan, vice-president of N. Ryan Co. of 491 Smith street, Brooklyn, is treasurer.

The board of directors consists of Emmett B. Simpson, Emmett B. Simpson, Inc., Queens, Long Island; James V. Turecamo, of James B. Turecamo Construction Co., Brooklyn; John V. D'Alborn, of B. Turecamo Contracting Co., Brooklyn; David B. Busch, of Mahoney and Busch, Brooklyn; Frank M. Knauss, of Washington Bulkley, Inc., Brooklyn; John Buoniello, of John Buoniello Contracting Co., Brooklyn; Maurice F. Hickey, of H. Hickey Co., Brooklyn.

Reports of continued slackening in inquiry for basic building materials are offset by the reports that plan filings at all the building bureaus of the city up to the middle of April, 1926, were 470 ahead of the same period of time in last year's record, but that investments so far this year had fallen off $39,822,000. Brooklyn and Bronx were slightly ahead of last year's plan filings, with Manhattan, Queens and Richmond boroughs lagging behind the record in the same period of time in 1925. Investments this year were ahead of those of 1925 for same period in Brooklyn, Bronx and Queens. Manhattan and Richmond were lagging.

Gravel Plant Moves To New Location

According to the *Nashville (Tenn.) Banner* the James Sand and Gravel Co., formerly of Paducah, Ky., has located at Johnsonville, Tenn., and will establish a plant at that place.

Barges, gas tow boat, pump boat, derrick and other equipment used in carrying on business operations are all new and said to have cost approximately $100,000. The incline used to carry the gravel from the river to the loading tracks of the N., C. & St. L. railroad is nearing completion and the plant will be ready to start soon.

South Dakota Surveys Its Gravel Deposits

MINNEHAHA COUNTY, South Dakota, has 355,000,000 cu. yd. of sand and gravel deposits, according to an investigation made by the South Dakota Geological and Natural History Survey. A conservative estimate would place the value of this mineral resource at $100,000,000, Dr. Freeman Ward, state geologist and head of the department of geology at the University of South Dakota, said recently in announcing the results of the survey.

The work was done by a party consisting of Prof. E. P. Rothrock, geologist, and Prof. R. V. Newcomb, engineer, under the direction of Dr. Ward. Similar surveys have been made of other counties, the plan being to continue the work until every county in the state has been surveyed.

Tests of the gravel made by Professor Newcomb in the highway laboratory of the college of engineering at the university, showed great differences in the quality of different deposits, the materials ranging from fine grained clayey deposits to gravels composed entirely of small cobbles. Each of these deposits has uses for which it is especially adapted. One of the objects of the investigation was to obtain information which would make it possible for the contractor, engineer or other interested person to know where materials suitable for the job in hand could be obtained and how much was available.—*Vermillion (S. D.) Republican.*

Consolidated Cement To Build Plant at Rockland, Maine

THE Consolidated Cement Corp., Chicago, Ill., in conjunction with the Cowham Engineering Co., Chicago, is to build a portland cement plant with an annual capacity of 1,500,000 bbl. at Rockland, Maine.

Representatives of the two concerns have for some time been acquiring the necessary quarries. The plant will be located on the waterfront, and, in order to obtain the necessary access, room for trackage, etc., fourteen parcels of real estate on Camden and Fales streets were secured. It is expected to be completed in about a year.

The cement company is said to have acquired from the Rockland and Rockport Lime Corp., Rockland, Maine, large areas of limestone deposits in various localities, sufficient to afford an ample supply of raw material for cement manufacturing purposes. President George B. Wood, of the Rockland & Rockport Lime Corp., who it is said, is in close touch with the new proposition, issued this statement:

"Although the Rockland & Rockport Lime Corp. is not directly interested in the cement company, financially, it is contemplated that the Limerock Railroad Co. will be the transportation medium between the cement quarries and the new plant at the waterfront. It is also contemplated the Rockland Transportation Co., the corporation controlled by the lime company, which owns and operates the lime barges, will function as the medium for water transportation for cement, from the new plant to the markets."—*Boston (Mass.) Globe.*

South Dakota's State Owned Cement Plant Shows Operation Loss

THE last quarterly audit of the state cement plant at Rapid City, S. D., shows that the enterprise had a book value of $2,420,543 on December 31, 1925.

The audit, which covers the operating period from November 1, 1925, to February 28, 1926, shows that during November and December the plant operated at a loss of $30,155.70. Cash receipts during the period covered by the audit amounted to $67,457, and the cash expenditures were $165,449.

Sales during the period amounted to $28,322 with cost of sales placed at $17,825, leaving a profit of $10,496. To this is added miscellaneous incomes of $932, but expenses for packing, loading, general administration costs, income charges, sales discounts, bags destroyed, depletion and depreciation total $41,583, leaving a deficit for the period.

The balance sheet for December 31 shows current assets, inventories and cash in banks totaling $454,691. Fixed assets, including lands, buildings and machinery, amounted to $1,953,423. Preferred charges, including a charge of $11,492 for "shut down," amount to $12,428, giving total assets of $2,240,543. The depreciation of the fixed assets is taken for the balance sheet.

Liabilities of the plant include $100,000 from the state general fund, accounts payable and bag redemption reserve of $52,451, appropriation, bond issue and accrued interest of $2,206,894 and surplus and undivided profits of $61,197.—*Sioux City (Iowa) Journal.*

A New French Cement Kiln

A KILN for burning portland cement has been patented by Ivan Emile Lanhoffer, of Paris, France (U. S. 1,582,831, April 27, 1926). It is a combination of a high temperature rotary kiln *a* (see cut) and a low temperature rotary kiln *b*, the hot gases from the first being used to heat the material in the second.

As the heat in the gases from the high temperature kiln is greater than is needed to do the work required of the low temperature kiln, the inventor passes part of these gases through a heat recovery section. This may include a boiler, a water heater or a dryer for coal or for raw cement materials. The remainder of the gases go on to *b*, the low temperature kiln, where they give the cement raw material its preliminary heating.

The gases are exhausted by a fan at the end of the low temperature kiln. This is placed above a large dust chamber which shows at the right of the drawing. Dust is removed from the gases taken out for heat recovery by passing them through a smaller dust collector of a special design.

The main object of the invention is to carry out the method of burning described in a previous patent of this inventor by which cement material is heated in a low temperature furnace and immediately transferred to a high temperature furnace (No. 563,452 filed May 24, 1922).

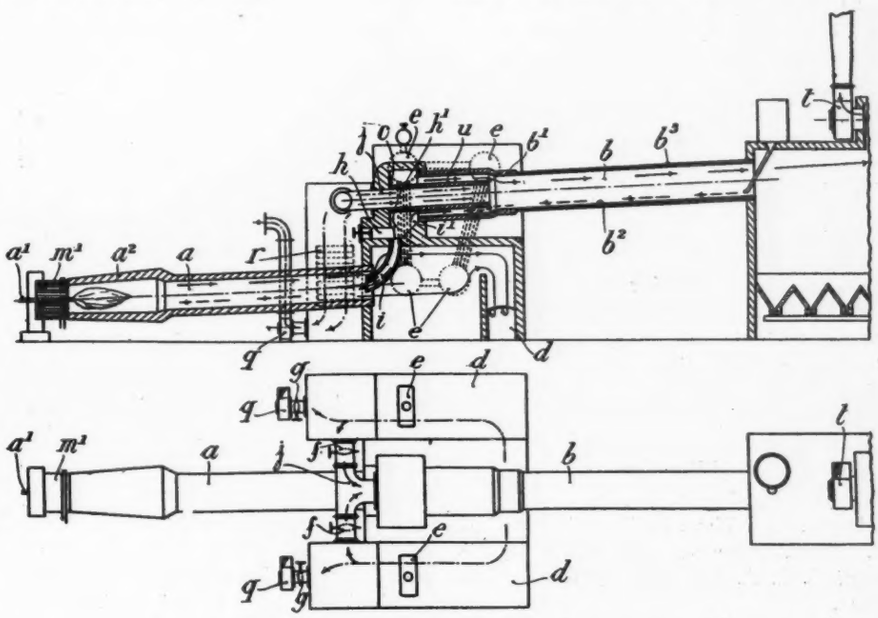
Blue Diamond Company Acquires Eastman Company

THE sale of the George L. Eastman Co., Hollywood, Calif., to the Blue Diamond Co. for a reported consideration of $1,500,000, has been recently announced. The Eastman company is said to be the largest retail building supply business on the west coast. The Blue Diamond Co. owns and operates sand and gravel plants, and are producers of lime and gypsum and their products besides carrying on an extensive wholesale and retail distribution of building materials. By the consolidation of the two companies, it is said the Blue Diamond Co. becomes the largest retail distributor of building materials in the country.—*Los Angeles (Calif.) Examiner.*

Concrete Work at the Virginia Portland Cement Plant at Norfolk

IN the description of the plant of the Virginia Portland Cement Co. at Norfolk, Va., published April 17, it was stated that the silos and packing house were built by the Macdonald Engineering Co. of Chicago. Not only the buildings mentioned but all of the concrete work was done by the Macdonald company, including the block work of buildings and the plastering on them.

The name of this company is associated with the construction of cement silos and packing plants and has been since they designed and built the first of the deep bin storages at the Dewey Portland Cement plant in Oklahoma. But the company has erected all the buildings and concrete foundations for many cement plants in the United States and other countries.



Cement kiln which has high and low temperature sections with heat recovery between

National Lime Association Convention Program Arranged

THE following is the tentative program for the eighth annual convention of the National Lime Association to be held at French Lick Springs hotel, French Lick, Ind., June 8 to 11:

PROGRAM

Tuesday, June 8

Morning

10 a. m.—Directors' meeting (first session).

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—Executive meeting of full membership, appointment of committees, audit, resolutions, Maxet committee report; Central Division, W. H. Magee, manager.

8:30 p. m.—Round-table (manufacture).

Wednesday, June 9

Morning

10 a. m.—"The Market for Lime," Irving G. Fellner, business manager, McGraw Hill Publishing Co., New York City.

10:45 a. m.—"Economical and Substantial Construction," J. P. Mollenkof, superintendent of construction, John H. McClatchy Co., Philadelphia, Penn.

11:30 a. m.—"Balanced Publicity," R. P. Brown, manager publicity department, N. L. A. (discussed by J. M. Deely).

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—"Concrete, Asphalt and Dirt Roads," C. R. Stokes, manager highway department, N. L. A. (H. W. Wood to discuss dirt roads).

2:30 p. m.—"Opportunities in the Industrial Field," L. B. Burt, manager industrial department, N. L. A. (discussed by H. E. Fitzroy).

4 p. m.—Ladies' afternoon tea (by courtesy of French Lick Springs hotel).

7 p. m.—Banquet, compliments of the French Lick Springs hotel. Entertainment furnished through the courtesy of the Valve Bag Company of America.

Thursday, June 10

Morning

10 a. m.—Executive session: "What Is Wrong with the Lime Industry?" W. E. Carson, president, Riverton Lime Co. Full discussion by membership. Adjourned business meeting of full membership. Reports of committees.

Afternoon

12:30 p. m.—Lunch.

1:30 p. m.—"There Is No Substitute," J. S. Elwell, manager, construction department, N. L. A. (discussed by C. M. Cadman).

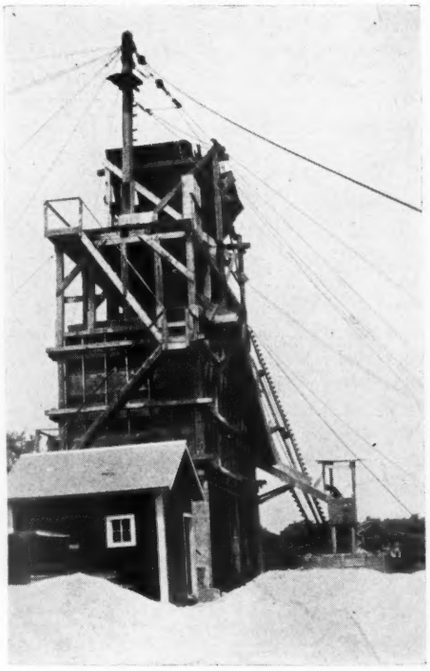
2:15 p. m.—"The Practical Aspects of Research," G. J. Fink, director Association Laboratories, N. L. A. (discussed by G. T. Weigart).

3 p. m.—Directors' meeting.

8:30 p. m.—Round-table (manufacture—second session).

Risley Sand and Gravel Plant Remodeled

THE plant of the Risley Sand and Gravel Co. on the banks of the Rock river at Dixon, Ill., has again resumed operations after making extensive alterations and improvements in the building and equipment. It is now quite modernized, operated entirely by electric power and has a capacity of about 500 tons of washed and screened sand and gravel per day.



Plant of the Risley Sand and Gravel Co. at Dixon, Ill., which has recently been enlarged and new equipment added

The material containing about 65% gravel is taken from the bed of the Rock river, where it occurs at a depth of about 40 ft. It is excavated with a 500-ft. span, 1-yd. Sauerman cableway excavator, operated by a Sauerman hoist and brought to the screening plant which operates on the gravity system. The oversize passes to a Western crusher and the sand and gravel to different bins or stock piles, according to their size. The screening plant is equipped with a Telsmith screen and sand settling tanks. Elliott C. Risley is the owner of the company.

Production of Phosphate Rock in Tennessee

COMPANIES now producing phosphate rock in the Mount Pleasant and adjacent sections of Tennessee include Charleston Phosphate and Mining Co., International Agricultural Corp., Federal Chemical Co., Hoover & Mason Mining Co., Ruhm Phosphate Co., Illinois Agricultural Association, Ligon & Huff, R. L. England and the Ridley Phosphate Co.

Shipments are now on the up grade, after a disastrous slump in 1921. That year only 283,000 tons were shipped. A gradual increase has occurred since that time, with 395,000 tons in 1922, 379,000 in 1923, 380,000 in 1924 and 479,463 in 1925, including some blue rock from Lewis county, making the total approximately 450,000 tons. This is shipped about half below the Ohio river, slightly less than that north of the Ohio, and some 14,000 tons west of the Mississippi.

Better methods of mining and the utilization of lower grade rock by these methods make fear of depletion of the supply in the near future groundless, say experienced miners, and the industry, with bright prospects ahead, bids fair to bring in still greater returns in the next few years.—*Columbia (Tenn.) Herald.*

Maryland Slag Company To Build Crushing Plant

THE Maryland Slag Co., Baltimore, Md., has awarded the contract for the erection of a new crushing plant at Sparrows Point, Md., to the M. A. Long Co. The plant will be of steel and concrete and plans call for a main building 40x80 ft. and storage bins 36x54 ft. Crushers, bucket elevators, conveyors and screening equipment will be installed to produce from 2000 to 3000 tons per day of crushed blast furnace slag for use as aggregate. The different equipment will be furnished by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.; Webster Mfg. Co., Tiffin, Ohio; W. S. Tyler Co., Cleveland, Ohio, and others.

The plant was designed by the Standard Slag Co., Youngstown, Ohio. C. E. Leach, Youngstown, will be the engineer in charge of construction.

L. A. Beeghly, Youngstown, Ohio, is president of the company, and R. A. Froehlinger, treasurer of the Arundel Corp., Baltimore, is secretary-treasurer.

Kinkaid Plant of the Union Rock Company To Be Improved

THE Union Rock Co., Los Angeles, Calif., is planning improvements to its Kinkaid plant at Azusa, Calif., which involve the expenditure of about $100,000. It is expected that along with new plant construction there will be installed a new and larger primary crusher.—*Azusa (Calif.) Journal.*

New Company to Quarry Georgia Limestone

THE Ainslie Lime Rock Co. has been organized with a capitalization of $500,000 to mine the Ainslie limestone deposits in Bleckley county, near Cochran, Ga. At the present time, a half mile of track leading to the deposit has been laid and a locomotive and two shovels have been purchased and placed on the ground. It is said that the company intends to manufacture portland cement also.

The limestone deposit is said to be quite extensive and similar in properties to the Ocala limestone of which so many excellent roads have been made in Florida.

The president of the company is A. B. Kissack, secretary and treasurer, General Construction Co., St. Louis, Mo. Other officers are B. E. W. Stout, vice-president, who is also president of the General Construction Co., St. Louis, Mo.; Lon W. Harlow, vice-president of the Southern Surety Co., Des Moines, Iowa, secretary; and Adrian W. Frazier, of the Davis and Frazier Construction Co., St. Louis, treasurer. Temporary headquarters have been opened at the Georgia Casualty building, Macon, Ga.—*Macon (Ga.) News.*

Insurance Companies to Require Rock Dusting in Mines

IN ORDER to help check the appalling loss of life through coal mine catastrophes, the Associated Companies have decided that every gaseous or dusty bituminous coal mine insured by them for compensation insurance must be rock dusted not later than October 1.

Rock dust has proven its value many times in stopping explosions, it is said. The process consists of coating all mine surfaces with a layer of powdered rock twice the depth of the coal dust. When an explosion starts, the concussion suspends the dust in the air.

Coal dust burns readily with explosive force. By having at least two particles of rock dust for every one of coal, the former acts as a curtain, absorbs the heat and smothers the flame.—*Chicago (Ill.) Tribune.*

English Quarry Managers to Hold Annual Conference

THE INSTITUTION of Quarry Managers, the British quarrymen's association, will hold their regular annual conference at Llandrinod Wells, July 12 to 17.

An innovation of the conference this year will be the award by Sir Henry P. Maybury, C.B., K.C.M.G., president of the institution, of the first Maybury medal and fellowship; a gold medal to be awarded yearly for the best paper submitted by a member of the institution to the conference. The adjudicators for the award are the president himself, Robert Bathurst, vice-president, and E. P. Page, chairman.

Another feature will be an exhibition of plant, machinery, etc., in conjunction with the conference, and special demonstrations of drilling, blasting, etc., in a quarry close to the exhibition belonging to Thomas Lant, J.P., who is also awarding a trophy for a golf competition for members to be competed for during the conference.

Graham Brothers Has Exhibit of Interest at Industrial Exposition

ONE of the exhibits at the sixth annual Harbor Industrial Exposition, Auto and Radio Show, held at Long Beach, Calif., recently, was that of Graham Brothers, Inc., operators of one of the largest rock products concerns in the entire West.

Graham Bros.' exhibit at the recent Harbor Industrial Exposition, held at Long Beach, Calif.

In connection with their slogan, "Build to Endure," replicas of two pyramids and a sphinx-like figure were modeled of damp clay, as examples of the most lasting of man-built structures. Views of Catalina Island, "the home of Graham Brothers Catalina Rock," were used to illustrate the placard background.

A drawing was held as a special feature of the exhibit, with free trips to Catalina Island offered holders of the winning numbers, and approximately 15,000 people registered at the booth. A bronze medal for special merit was awarded the Graham Brothers, Inc.

Sales of Building Limestone in Bedford-Bloomington District in 1925

THE sales of limestone for construction by the quarrymen in the Bedford-Bloomington oolitic limestone district of Lawrence and Monroe counties, Indiana, in 1925, amounted to 11,803,890 cu. ft., valued at $14,203,120, according to reports of producers to the Bureau of Mines, Department of Commerce. This is an increase of 7% in quantity but less than 1% in value. The quantity sold is greater than has ever before been reported, being slightly in excess of the sales for 1923.

The stone sold by the quarrymen in the form of rough blocks amounted to 5,168,780 cu. ft., valued at $3,109,746, an increase of 12% in quantity and 9% in value.

The dressed stone sold by quarry operators who also operate mills was as follows: Sawed stone, 4,431,660 cu. ft., valued at $4,629,272; semi-finished stone, 234,490 cu. ft., valued at $447,853; cut stone, 1,968,960 cu. ft., valued at $6,116,249.

Over 40% of the rough blocks sold by the quarrymen is sold to mills in the district who mill the stone and resell it. Some of the quarry operators who also operate mills buy rough blocks, mill them, and sell the milled product. The sales of this dressed stone in 1925 amounted to 2,087,860 cu. ft., valued at $5,629,269, an increase of 19% in quantity and of 21% in value.

The sales of the different classes of this stone were as follows: Sawed stone, 482,380 cu. ft., valued at $492,587; semi-finished stone, 25,930 cu. ft., valued at $44,885; cut stone, 1,579,550 cu. ft., valued at $5,091,797. These figures represent increase in quantity and value for all classes of stone.

Large Flux Stone Contract Placed

THE Rockland-Rockport Lime Co., Rockland, Maine, is reported to have a contract which calls for 70,000 tons of limestone yearly, to be used in the new blast furnace of the Mystic Iron Works at Everett, Mass. This would indicate that the long rumored possibilities of blast furnaces to be built in New England which would use raw materials brought in by the cheap water route had become an actuality.

Crushing and Screening Equipment

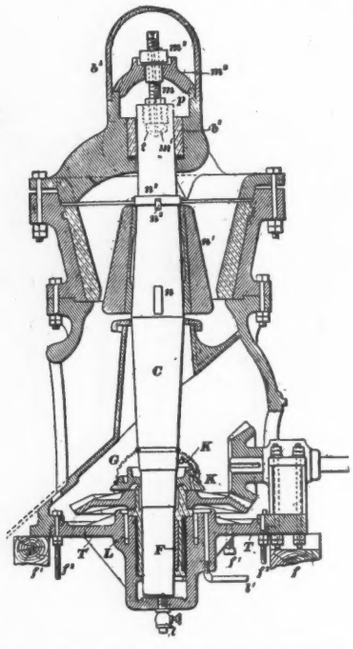
A Supplement to Previous Articles

By Hugo W. Weimer
Consulting Engineer, Milwaukee, Wis.

TO submit additional information regarding equipment previously discussed and to correct an error, the writer wishes to present this supplement. In the article of May 1 issue, ROCK PRODUCTS, under the heading of rotary screens, table No. 2, for 24-in. screen diameter, 2-in. feed and ½-in. product, the capacity should have been given as .9 tons instead of 1.9 tons.

Another new and novel type of vibratory screen is also illustrated herewith, as well as the new Traylor finishing crusher and an obsolete design of the McCully gyratory crusher.

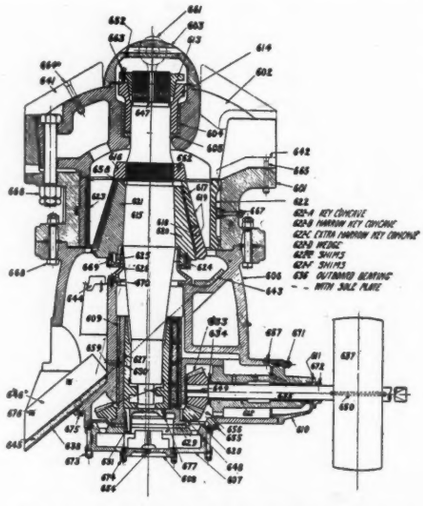
The Traylor "Bulldog" finishing gyratory crusher, Type "T," was mentioned in the writer's article in ROCK PRODUCTS of March 6 and to illustrate a novel feature a cut is



Crusher in which concaves are set in a novel way

shown herewith. The concaves are set vertical and made in sections similar to other makes, but instead of using zinc to set and hold in place the concaves, they are wedged in place by means of a key section which is secured by a bolt as shown.

Our study of gyratory crushers would hardly be complete without mention of a very old style McCully gyratory crusher as built about 35 years ago. Two features were exclusive with this model of gyratory when first introduced, being the shaft suspension and the drop bottom plate. The first mentioned made it unnecessary to have step buttons at the bottom to support the shaft



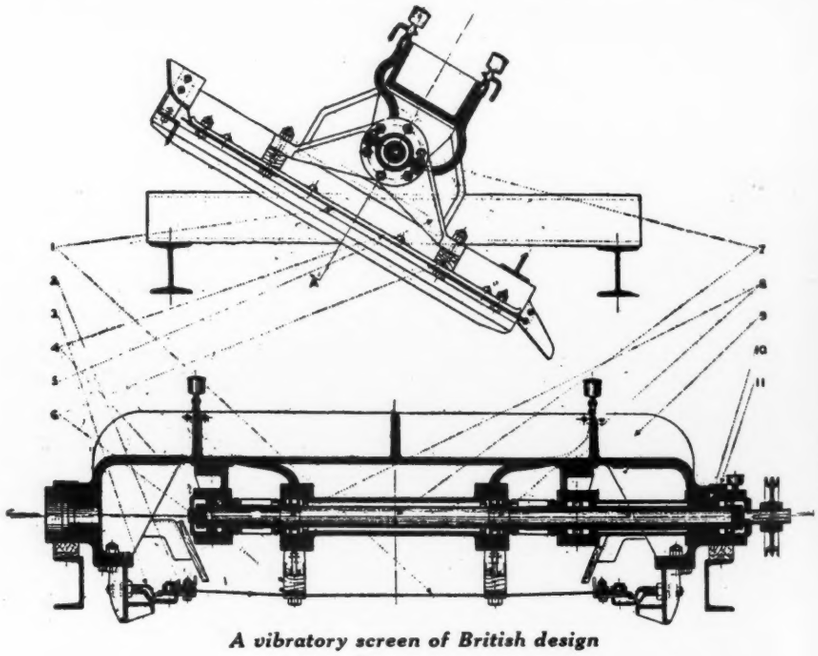
The first crusher made with shaft suspension and drop bottom plate

and the second made it possible to remove the eccentric and gear without disturbing the main frame. The unique suspension method should be noted as compared to the present-day practice.

The Grange Iron Co., Ltd., of Durham, England, produces the mechanically operated Hoyle vibratory screen which has the screen cloth stretched transversely across its area and fastened to each side of a stationary frame. Two vertical contact bars secured to the cloth and to the vibratory arms above, provide the vibratory action. The drive shaft has two eccentric portions, one on each vibratory arm, which are placed at 180 deg. to each other, and when the shaft is rotated at 1500 r.p.m., 3000 vibrations per minute are produced, of 1/16-in. vertical motion to the screen cloth. The frame may be rotated and set at any desired angle. The screen surface is 4 ft. wide and 6 ft. long, requiring 2 h.p. to operate and is rated at a capacity of 50 tons per hour with ¼-in. mesh cloth.

Production and Imports of Pyrites Increase in 1925

THE production of pyrites in the United States in 1925 amounted to 170,081 long tons, valued at $650,448, according to figures compiled by the Bureau of Mines, Department of Commerce. This is an increase of 6% in quantity, but only 1% in value, as compared with the 1924 output, which was 160,096 long tons, valued at $645,262. The quantity of pyrites sold and consumed by producing companies also increased 6%.



A vibratory screen of British design

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

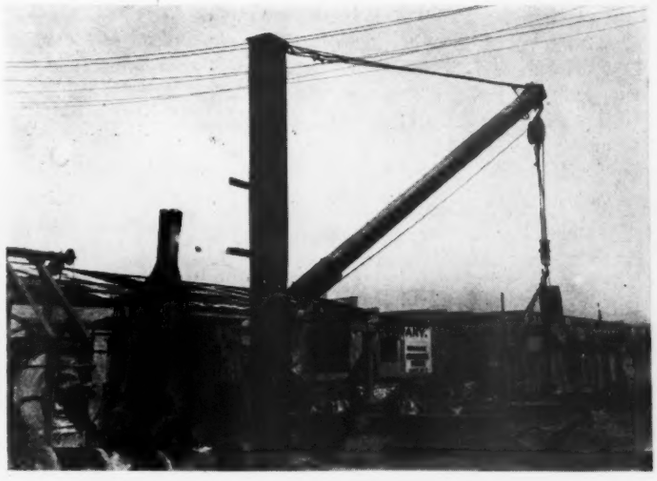
Making Concrete Pipe By Centrifugal Process

Plant of R. C. Semple, El Paso, Texas

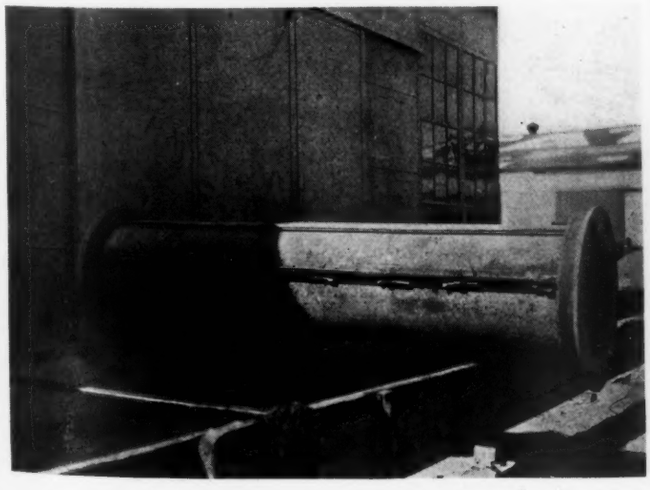
CONCRETE pipe is used in the southwestern states to an extent that few of us who live in other parts of the country realize. In the arid and semi-arid districts the concrete pipe line is second only to the open ditch as a carrier of water. Owing to the excessive evaporation in the dry portions of the country the pipe has replaced the ditch in many places and the tendency is to use more of it. In Los Angeles and some other places the manufacture of concrete pipe has the status of a big industry.

Under such circumstances it is not surprising to find a plant employing one of the latest methods of concrete pipe making in El Paso, Texas, since the city is the metropolis of the desert country, with no other city of importance nearer than 600 miles.

Plant of R. C. Semple, El Paso, making concrete pipe by the centrifugal process



Derrick used to place molds on live rolls and remove them to curing house track



Mold and pipe on track along which it rolled to the curing room

Finished pipe in the yard. Note the sharp edges of the square ends

The plant is owned and operated by R. C. Semple, and the system of pipe making used is that of the Hume Pipe and Concrete Construction Co. of London, Eng.

This system uses centrifugal force to harden the pipe and to give it a finish on both the inner and outer surfaces. The reinforcing is placed in a steel mold and the mold is filled with concrete in much the same way that ordinary pipe is made by hand. Then the mold with the concrete in it is revolved rapidly. Centrifugal force presses the concrete to the outside against the inner face of the mold. It also compresses it so hard that when the mold is stripped you cannot push your finger into the concrete no matter how hard you may try. The green pipe may be handled as easily as ordinary pipe that has had several hours of setting.

Spinning the Pipe

The way in which the molds are revolved or "spun" is to place them on a set of live rolls. As these rolls revolve they turn the mold, which lies on them, by friction. The rolls are run by a steam engine with a small upright boiler and this gives an easy method of varying the speed of the rolls. At the start the speed is such that the peripheral speed of the pipe is from 500 to 600 ft. per minute. At the finish the peripheral speed is brought up to 2700 ft. per minute. The spinning is carried on for about a minute and a half.

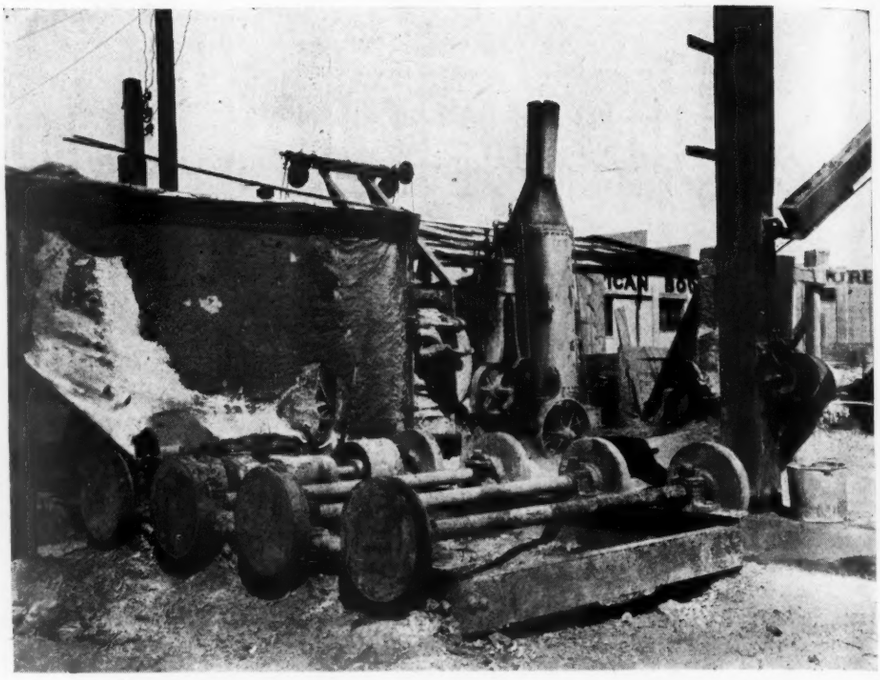
The aggregates used are sand and crushed limestone. For ordinary pipe a mixed aggregate is made up of 40% sand, 25% of limestone from ¼-in. down and 35% of limestone from ¾-in. to ¼-in. For special high pressure pipe the aggregate is 75% sand and 25% of limestone screenings. The high pressure pipe is richer in cement, a 1 to 2½ mix being used. The ordinary pipe will safely stand pressures up to 50 lb.; the high pressure pipe will stand pressures up to 100 lb.

Although the pipe pressure is very hard the mold is left on the high pressure pipe for eight hours. Curing is carried on in a steam room where the temperature is 160 deg. F. for eight hours and afterward in the yard for 15 days.

Spinning Takes Out Excess Water

The concrete is mixed to ½-in. slump and with this amount of water at 28 days it has a resistance in compression of 6776 lb. per square inch after spinning, the average of several tests. The water-cement ratio is practically constant, however, whatever the amount of water used in the mix originally. The spinning of the mold compacts the solids and leaves any excess water on the inside so that it can be poured out when the rolls the stopped. This insures not only the strength of the concrete but its uniformity.

The same centrifugal action that keeps the water on the inside keeps enough of the finer particles of the mix there to finish the interior with a coating that is extremely smooth. It has almost the appearance of a glazed finish. The outside is smooth, too, for the centrifugal force drives the concrete to the inner surface of the mold and holds it there firmly.



Live rolls on which the molds are "spun." The rolls are driven by the steam engine in the background, because speed is easier regulated by steam drive

The pipes have square ends without the usual spigot and bell. In laying the pipe a reinforced concrete ring, made in the same way that the pipe is made, is slipped over each joint. This is cemented firmly in place, making the joint of the same strength as the pipe.

Spiral Reinforcements

Reinforcing is by a continuous spiral of heavy wire. This is wound on a form invented by Mr. Semple. It can be collapsed or expanded to fit any size of pipe. After the spiral has been wound it is slipped off and placed in the mold.

The system of handling the molds and pipe before and after spinning is excellent. The mold is picked up by a small boom derrick with a hand winch which stands by the rolls. If the mold is to be sent to the curing room the derrick places it on a track made of 2x12 pieces set on edge along which it is rolled to the curing room.

There can be no doubt about the ability of the pipe to stand heavy pressures. While visiting the plant a Rock Products editor saw two lengths and a joint tested for some minutes under 92 lb. water pressure. A few drops escaped below the joint ring where it had been cemented to the pipe, but the pipe did not even "sweat" while the pressure was continued.

Some long lines of this pipe have been placed in service. A railroad company put in 9000 ft. of the high pressure pipe at Slayton, Texas, and tested 2000 ft. of it by filling it with water under 100 lb. pressure. At the end of 24 hours it was judged that 30 gallons had escaped, but the amount was so small that it could not be read accurately.

The British company which owns the patents for making this pipe has made a great deal of it in Australia, where much concrete pipe is used for the same reasons that it is used in the dryer parts of the United States. It has been found satisfactory there in respect to permanence as well as in resisting pressure.

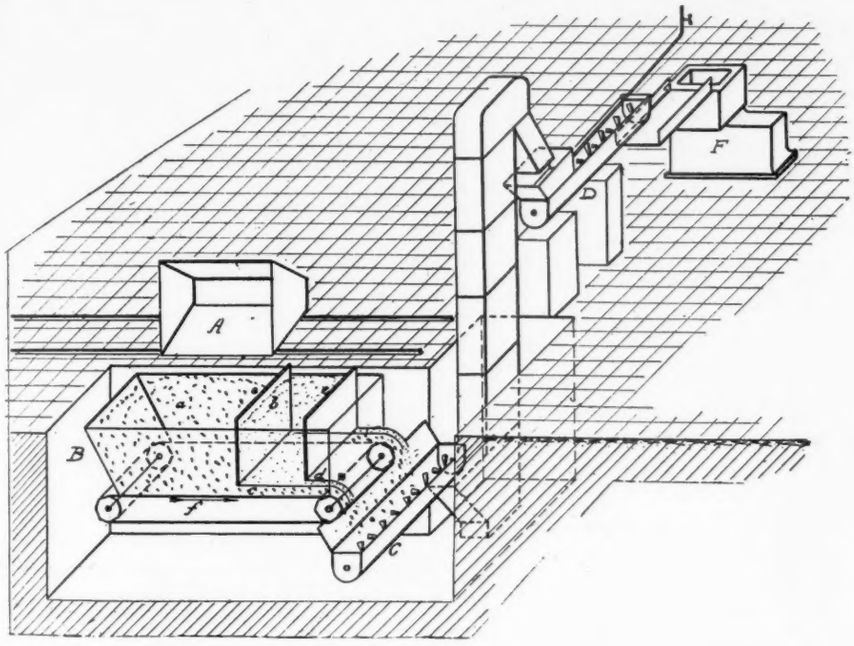
Canadian Company to Make Cement Pipe Under European Patents

THE Consolidated Pipe Co., Ltd., Montreal, has just been organized to manufacture concrete pipe and kindred products by a centrifugal process for which they hold Canadian rights. The process is new to Canada, but is said to have met with success in western Europe and Australasia. In France there are nine factories using the Caron or Stac patents. The Consolidated Pipe Co. will combine the French invention with the Moir-Buchanan Scotch invention. The pipe will vary in size from 3-in. up to large sewer pipe size. The plant will be started on at once and will be in operation this summer. The company officials are: President, J. H. Sherrard; vice-president, R. B. Williamson; directors, Paul E. Joubert, R. W. Mitchell and George A. Ross. The secretary and general manager is H. T. Meldrum. The office is in the Canada Cement building, Phillios Square, Montreal.

Continuous Mixer Used in French Cement Products Plants

THE drawing shows a continuous mixer of French design (systeme Brandt) which is used for manufacturing cement products. It is taken from the French *Revue des Materiaux de Construction*. The description accompanying it says that it is used in plants for making blocks, pipe and tile and also for making sand-lime brick and mentions several companies that are using it in different parts of France.

Continuous mixers are not usually considered able to make so good a concrete as dry mixers. One reason for this is the difficulty of feeding the cement and aggregate uniformly. The French mixer shown here would appear to have a good method of feeding, and if the wet and dry mixers are made long enough to give a sufficient time it is said that good concrete results.



Novel continuous mixer used in a French cement products plant

The novel feature is the method of measuring the sand and cement into the mixer. For this there are two hoppers, one for sand and one for cement, over a conveyor. These are marked *a* and *b* in the cut. Both are filled by a car *A* on the track above (shown in the dumping position). The conveyor, which is of the metallic plate type, although a belt would probably do as well, runs slowly and drags both cement and sand from the hoppers. The amount of each that is drawn out is regulated by the length of the boards *e*. Cement and sand lie in distinct streaks, *c* and *d* on the conveyor, so that the amount of each that is being fed may be told at a glance.

Leaving the conveyor, the sand and cement fall into the continuous dry mixer *C* which is a trough containing a shaft with paddles. These paddles mix the sand and cement and urge the mixture forward to a chute leading into the boot of an elevator. The elevator discharges into the wet mixer *D* and this discharges into the chute that leads to the press *F*.

Concrete Products Association Plans Extensive Work for 1926

THE executive committee of the National Concrete Products Association has drawn up a comprehensive program for their activities for 1926. The following extracts from a letter from "Spec" Collins, secretary of the association, contains a brief outline of what is planned:

"1. To improve and maintain the quality of cement products by a practical application of laboratory methods to plant operation. Not only is it intended to increase quality, but in so doing, reduce production cost.

"2. To assist in every way practical a greater distribution of our products by the application of modern methods of merchandising and advertising.

"3. To work with proper officials, both state and local, to see that proper legislation is enacted and enforced making possible the use of only quality products in masonry construction.

"4. To educate not only the building public but our own members and employes, in the use of our product and in the various steps we have taken to control its quality.

"5. To conduct a vigorous campaign for equitable insurance rates on concrete masonry construction.

"6. To secure just and equitable freight rates that will allow a greater expansion of our present markets.

"7. To secure, wherever possible, proper publicity on the work of our association and its members through national and local publications.

"8. To, wherever possible, put our product in buildings 'above the grade,' particularly in the line of home construction.

"9. To work with architects, contractors, and builders to include cement products in specifications for factories, warehouses and public buildings.

"10. To prosecute a vigorous campaign for new members for the organization of state and local organizations fully recognizing that in unity and members there is strength."

New Cement Products Plant Opens at Dade City

THE new plant of the Dade City Cement Products Co., Dade City, Fla., has just started production. While it has only a present capacity of 7000 cement brick and 4500 hollow tile per 9 hr. day, facilities for increasing this have been left in planning the layout and installation of machinery. The entire plant is electrically operated. Sand for the products is obtained from the company's own deposit in Lake county and is said to be the equal in quality of the well known Lake Wier sand. Arrangements are being made with the Seaboard Air Line Railway for building a siding with a capacity for 10 cars. This will be on a trestle with bins beneath, in which the sand can be quickly unloaded from hopper bottom gondolas.

The company is composed of Frank E. Mertz, president; W. J. Trough, vice-president; R. B. Sturkie, secretary-treasurer, and George Smith, superintendent.—*Tampa (Fla.) Telegraph.*

Durability of Cement Drain Tile and Concrete in Alkali Soils

THIS PAPER is the fourth progress report and gives the results of the inspection in 1923 of experimental drain-tile and concrete block installations at eight alkali-bearing projects in the west. The investigation has been carried on since 1913, and the conclusions to date are that the best quality of concrete will disintegrate when exposed to severe alkali attack and that installations of concrete in soils containing more than 0.1% of salts of the sulphate salts should be preceded by an examination of surrounding conditions.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 10:

Southwestern Freight Bureau Docket

8174—**Chatts,** from points in Oklahoma to points in Oklahoma. To establish the following rates in cents per 100 lb. on chatts, carloads, minimum weight 90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will apply, but in no case less than 40,000 lb. Producing points on the N. E. O. Ry., viz.: Anna Beaver, Okla.; Black Hawk, Okla.; Blue Goose, Okla.; Cardin, Okla.; Century, Okla.; Commerce, Okla.; Goodrich, Okla.; Hunt, Okla.; Miami, Okla.; North Maimi, Okla.; Picher, Okla.; Ontario, Okla.

To	Rates	To	Rates
Gano	7½	Tyron	8
Cushing	7½	Carney	8
Wild Horse	8	Guthrie Junction	8
Agra	8	Fallis	8

Complaint has been made by a consumer located at Cushing as to the abrupt jump of 1½ cents per 100 lb. for a haul of seven miles from Norfolk to Cushing, the rate to Norfolk being 7 cents per 100 lb., and the propriety of grouping stations Gano to Oklahoma City at a blanket rate of 8½ cents is also questioned.

8179—**Silica,** from points in Arkansas to interstate points. To establish the following rates in cents per 100 lb. on silica, carloads, minimum weight 50,000 lb., from and to points shown below:

From Benton, Ark., to	Rates
Brisbane, Ill.	29
Buffington, Ind.	29
Chicago, Ill.	29
Butterfield, Ark., to Chicago Heights, Ill.	29
Butterfield, Ark., to Dyer, Ind.	29
Cove Creek, Ark., to East Chicago, Ill.	29
Cove Creek, Ark., to East St. Louis, Ill.	20
High Point, Ark., to East Joliet, Ill.	29
High Point, Ark., to Gary, Ind.	29
Malvern, Ark., to Griffith, Ind.	29
Malvern, Ark., to Hammond, Ind.	29
Pernort, Ark., to Hartsdale, Ind.	29
Pernort, Ark., to Indiana Harbor, Ind.	29
From Rockport, Ark., to	**Rates**
Joliet, Ill.	29
Matteson, Ill.	29
St. Louis, Mo.	20
South Chicago, Ill.	29
Whiting, Ind.	29
Cleveland, Ohio	44½
Detroit, Mich.	43½
New Orleans, La.	33½

There is a development of silica at High Point, Ark., and it is necessary that rates be established that will enable the free movement in competition with other sources of production.

8231—**Lime** from Limedale Spur and Ruddells, Ark., to points in Louisiana. To establish a rate of 22½ cents per 100 lb. on lime, carloads, minimum weight 30,000 lb., from Limedale Spur and Ruddells, Ark., to points on the V. S. & P. Ry., Alpena to Fosters, La., inclusive. Shipper states that they are not in position to market their product in competition with rates that are in effect from Tennessee and Alabama kilns.

New England Freight Association Docket

10106—**Sand,** common (not molding fire, filter or blasting), run of the bank or screened and gravel, screened, minimum weight 90% of marked capacity of car, from North Wilbraham, Mass., to Wingdale, N. Y., $1.44 per net ton. Reason—To establish commodity rate from North Wilbraham the same as now published on trap rock from Westfield.

10107—**Flint rock,** minimum weight 90% of marked capacity of car, from Bates, Lockes Mills, South Paris, Maine, to Still River, Conn., 19, via G. T.-B. & M.-Worcester-N. Y. N. H. & H. R. R. Reason—To establish rates that will move the traffic.

10112—**Core sand,** minimum weight 90% of marked capacity of car, except when car is loaded to cubical or visible capacity, actual weight will apply, from West Groton, Mass., to Bristol, Meriden, New Britain and Waterbury, Conn., 13½ cents. Reason—To permit movement of traffic.

10122—**Flint rock,** minimum weight 90% of marked capacity of car, from Bath and Bowdoinham, Maine, to Sill River, Conn., 19 cents. Reason—Comparable with that currently in effect from point of origin to Trenton, N. J., applicable on crude feldspar.

10133—**Stone, broken or crushed,** in bulk, in gondola or other open cars, minimum weight 90% of marked capacity of car, except when cars are loaded to cubical or visible capacity, actual weight will apply from Westfield, Mass., to Arlington Siding, Bangall, Beacon, Brewster, Clove Branch Junction, Didell, Fishkill Plains and Hopewell, N. Y., and Danbury, Conn., $1.10 per net ton. Reason—To meet competitive conditions.

10134—**Limestone,** ground, minimum weight 50,000 lb., from West Stockbridge, Mass., to Wawa, Pa., 22. Reason—Establishment of proposed rate will permit movement.

Central Freight Association Docket

13085—**Crushed stone, gravel and torpedo sand,** carloads, Joliet and Plainfield, Ill., to points shown below: Proposed—To following Indiana cities: Shelby, 85 cents; Wheatfield, 85 cents; San Pierre, 85 cents; North Judson, 85 cents; Knox, 85 cents; Hamlet, 85 cents; Walkerton, 90 cents; North Liberty, 90 cents; Chesterton, 90 cents; La Porte, 90 cents; New Carlisle, 90 cents; South Bend, 90 cents; Mishawaka, 90 cents; Otis, 90 cents.

13092—**Agricultural limestone** (ground or pulverized), agricultural limestone meal, agricultural limestone screenings, carloads, Piqua, Ohio, to Cincinnati, Ohio, and related points. Present rate: As published in B. & O. R. R. tariff H-3338. Proposed, $1 per net ton.

13096—**Core sand,** carloads, Juniata, Mich., to Huntington, Ind. Proposed rate, $2.52 per net ton; present rate, class basis.

13100—**Feldspar,** carloads, minimum weight 50,000 lb., Murphysboro, Ill. (rates in cents per net ton).

To	Present	Proposed
Derry, Penn.	530	450
Lisbon, Ohio	450	390
Kenova, W. Va.	390	340

13104—**Sand** (except core, engine, filter, fire or furnace, foundry, glass, grinding or polishing loam, molding or silica) and gravel, carloads, Kent, Ohio, to following representative destination points:

	Miles	Proposed rate
Medina, Ohio	38	85
Burton, Ohio	64	90
Cuyahoga Falls, Ohio	7	70
Girard, Ohio	42	80
Leavittsburg, Ohio	27	70
Lester, Ohio	55	85
Lowellville, Ohio	*	90
Medina, Ohio	50	85
Newton Falls, Ohio	25	70
Ravenna, Ohio	8	70
Rittman, Ohio	31	75
Sterling, Ohio	38	80
Struthers, Ohio	*	90
Warwick, Ohio	27	70
Ashtabula, Ohio	88	110
Conneaut, Ohio	103	120
Geneva, Ohio	59	110
Painesville, Ohio	63	90
Rocky River, Ohio	41	80
Wickliffe, Ohio	48	85
Willoughby, Ohio	52	85
Champion, Ohio	86	110
New Lyme, Ohio	106	120
Salem, Ohio	62	90
Ashland, Ohio	63	90
Aurora, Ohio	55	85
Austintown, Ohio	44	90
Braceville, Ohio	25	70
Burbank, Ohio	43	80
Garrettsville, Ohio	42	80
Hubbard, Ohio	50	90
Leetonia, Ohio	60	90
Lisbon, Ohio	71	95
Niles, Ohio	38	80
Phalanx, Ohio	33	80
Sterling, Ohio	35	80

*Youngstown rate.

13135—**Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, East Liverpool, Ohio, to Rootstown, Ohio. Present rate, $1 per ton, intermediate to Ravenna, Ohio; proposed, 90 cents per ton.

13142—Crushed stone, carloads, Ingalls, Ind., to Indianapolis, Clermont, Avon and Augusta, Ind. Present rates, to Indianapolis, 81 cents; to Clermont, 86 cents; to Avon, $1.04, and to Augusta, Ind., rate of 85 cents per net ton. Proposed, to Indianapolis, Ind., 70 cents per net ton; to Clermont, Avon and Augusta, Ind., rate of 75 cents per net ton.

13146—Gravel and sand (except blast, core engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica), carloads, Wolcottville, Ind., to Palos Park and Orland, Ill., and from Whartons, Ind., to Worth, Ill., Palos Park and Orland, Ill. Present rates—From Wolcottville, Ind., to Palos Park and Orland, Ill., 90 cents per net ton and from Whartons, Ind., to Worth, Palos Park and Orland, Ill., $2.30 per net ton, (sixth class). Proposed—From Wolcottville, Ind., to Palos Park and Orland, Ill., 90 cents per net ton; from Wharton, Ind., to Worth, Ill., 77 cents per net ton, and from Wharton, Ind., to Palos Park and Orland, Ill., rate of 90 cents per net ton.

13148—Sand (other than blast, core, filter, fire or furance, foundry, glass, grinding or polishing loam, moulding or silica), or gravel, carloads, Harbor Bridge, Pa., to New Castle, Pa., for connecting line deliveries. Present rate, 60 cents per ton; proposed, 50 cents per ton.

13156 — Crushed stone, carloads, Woodville, Gibsonburg and Maple Grove, O., to Detroit, Mich. Present rate, $1.05 per net ton; proposed, 90 cents per net ton.

13158—Crushed stone, carloads, except when car is loaded to full cubical or visible capacity actual weight will apply, St. Paul, Ind., to Columbia, O., distance of 56 miles, (File D406-51-666-4) (Docket No. 3378). Present rate, $1.10 per net ton; proposed, $1.00 per net ton.

13169—**Sand,** carloads, Overpeck, Ohio, to Lorain and Cleveland, Ohio. Present rate, $2.10 per net ton; proposed, $1.70 per net ton.

13170—**Sand** (except blast, core engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, Ginger Hill and Rupel, Ind., to Ainsworth, Ind., and Sedley, Ind. Present rate, 88 cents per net ton; proposed, 97 cents per net ton to Ainsworth, Ind., and 92 cents per net ton to Sedley, Ind.

13178—**Sand and gravel,** carloads, Zanesville and points in the Zanesville group located on B. & O. R. R. to points shown.

From Zanesville, Dillon, Sonora, Fair Oaks, Philo

To—	Proposed	Present
Canton, Ohio	(1) (2) 110	(2) 110
Luhrig, Ohio	(3) 110	140
New Philadelphia, Ohio	(1) 110	120
Mineral, Ohio	(3) 110	140
Carbondale, Ohio	110	.....
Dundas, Ohio	110	140
Valley Junction, Ohio	(4) 120	120
Armitage, Ohio	100	.....
Carrington, Ohio	80	.....
Amesville, Ohio	140	.....
Lathrop, Ohio	140	.....
Poston, Ohio	100	.....
Murray City, Ohio	100	.....
Orbiston, Ohio	100	.....
New Straitsville, Ohio	100	.....
New Fittsburgh, Ohio	100	.....
McArthur, Ohio	110	.....
Navarre, Ohio	(1) (2) 110	(2) 110
Justus, Ohio	(1) (2) 110	(2) 110
Massillon, Ohio	(1) (2) 110	(2) 110
Dover, Ohio	(1) 110	120
Beach City, Ohio	(1) (2) 110	(2) 110
Mineral City, Ohio	(4) 120	120
Zoarville, Ohio	(4) 120	120
Oneida, Ohio	(4) 120	120
Zoar, Ohio	(4) 120	120
Waynesburg, Ohio	(4) 120	120

Present rates where shown are published in B. & O. R. R. Ohio No. W. L. 2728. Where no rates are shown class rates apply.

(1) Rate on gravel, 100.

(2) Will not apply from Zanesville for W. & L. E. delivery.

(3) Dundas rate applicable under intermediate clause.

(4) Rate on gravel, 110.

13180—**Lime,** common, hydrated, quick or slacked, carloads, Cold Springs and Durbin, Ohio, to Weirton, W. Va. Present rate, 21½ cents (sixth class); proposed, 17 cents.

13182 — **Crushed stone,** carloads, McVitty's, Ohio, to stations on the N. Y. C. & St. L. R. R. Present rate, sixth class; proposed—

To—	Rate	To—	Rate
Dyer, Ohio	80	Lima, Ohio	90
Rawson, Ohio	80	Hume, Ohio	100
Mt. Cory, Ohio	80	Buckland, Ohio	100
Bluffton, Ohio	85	Glynwood, Ohio	100
Beaver Dam, Ohio	90	St. Mary's, Ohio	100

Southern Freight Association Docket

26597—**Sand**, from Bostic, Forest City and Logan, N. C., to all stations on the Interstate R. R. Lowest combination now applies. Proposed rate on sand, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to visible capacity actual weight will govern, $1.67 per net ton, based on the proposed Alabama-Georgia scale, using the maximum distance.

26601—**Sand and gravel**, from Montgomery, Ala., to Dublin, Ga. Present rate, $2.38 per net ton (Macon, Ga., combination). Proposed rate on sand and gravel, straight or mixed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern, from Montgomery, Ala., to Dublin, Ga., $1.76 per net ton, made on basis of the carriers proposed Alabama-Georgia scale.

26614—**Ground or pulverized limestone**, from Sparta, Tenn., to Booneville, Miss. Present rate, $2.43 per net ton (Jackson, Miss., combination). Proposed rate on ground or pulverized limestone or marble, carloads, minimum weight marked capacity of car, except when car is loaded to full visible capacity actual weight will apply, from Sparta, Tenn., to Booneville, Miss., $2.03 per net ton, based on the proposed Georgia scale.

26630 (carrier)—**Limestone, stone and slate**, from Fairmount, Bolivar and Whitestone, Ga., to Lambs Junction, S. C.—cancellation. It is proposed to cancel the present commodity rate of $1.98 per net ton on limestone, stone, slate, ground, crushed, powdered or pulverized, carloads, from and to the points mentioned as published in L. & N. R. R. I. C. C. A-15302, account of no movement. Combination rates to apply after cancellation.

26648—**Gravel**, from Nashville, Tenn., to Trenton, Tenn. In lieu of combination rate of $1.73 per net ton, it is proposed to establish intrastate commodity rate of $1.47 per net ton on gravel, carloads, minimum weight stenciled capacity of car, except where cars are loaded to visible capacity and (or) in absence of weighing facilities at shipping point, if freight is weighed in transit or at destination, carloads, minimum weight will be 90% of stenciled capacity of car, from Nashville to Trenton, Tenn., same as the rate on crushed stone from Mimms, Tenn.

26668—**Sand**, from Montgomery, Ala., to Brownson, Ala. In lieu of present rate of $1.30 per net ton, it is proposed to establish rate (applicable intrastate) of 79 cents per net ton on sand, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their full visible capacity actual weight will govern, from Montgomery to Brownson, Ala., same as rate in effect to Sylacauga, Ala.

26678—**Sand and gravel**, from Memphis, Tenn., to Elizabeth, Greenville, Miss., and intermediate points. It is proposed to establish reduced rate of $1.13 per net ton on sand and gravel, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will apply, carloads, from and to the above-named points The proposed rate is the same as the present rate from Greenville to Memphis, from Iuka, Miss., to Greenville, Miss., and is also the same as the rate from Paducah, Ky., to Memphis, Tenn.

26709—**Lime**, from Burns, Tenn., to Brookport, Ill. In lieu of Class "A" rate of 25 cents per 100 lb., proposed to establish commodity rate of $2.59 per net ton on lime, carloads, minimum weight 30,000 lb., from Burns, Tenn., to Brookport, Ill., same as rate in effect to Cairo, Ill.

26752—**Sand**, from St. Louis, Mo., group to Nashville, Tenn. It is proposed to establish from St. Louis, Mo., and group to Nashville, Tenn., via C. B. & Q. R. R., Metropolis, Ill., P. & I. R. R., Paducah, Ky., and the N. C. & St. L. Ry., the same rate on molding sand, carloads, as applicable via the L. & N. R. R., viz., $2.65 per net ton.

Western Trunk Line Docket

1062-J—**Sand and gravel**, carloads, from Eddyville, Iowa, to stations in Missouri on C. B. & Q. R. R., of which the following are representative. Present, no through rates; proposed, see below.

To	Proposed
Lancaster	$1.05
Kirksville	1.15
Trenton	1.35
Bucklin	1.40
Macon	1.50

Minimum weight 90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will be the minimum weight, except that in no case will the minimum weight be less than 40,000 lb.

2051-T—**Stone, crushed**, carloads, from Jasper, Pipestone, Quartzite, Minn., and Sioux Falls, S. D., to Wellman, Iowa. Rate, present, class; proposed, 12 cents per 100 lb. Minimum weight 90% of marked capacity of car, except when car is loaded to full visible capacity, actual weight will apply, but not less than 50,000 lb. (By shipper.)

5080-A—**Lime**, carloads, from Port Byron and Cordova, Ill., to Rapid City and Piedmont, S. D. Rates—Present, Rapid City, 56½ cents per 100 lb.; Piedmont, 87 cents per 100 lb., or Class C. Proposed, 28 cents per 100 lb. to both points. Minimum weight 50,000 lb. (By shipper.)

5313-A—**Stone, crushed**, carloads, from Sugar Creek, Kansas City and Pixleys, Mo., to points in Nebraska on the Mo. Pac. R. R. Present rates as shown in tariffs of Mo. Pac. R. R. Proposed—To establish a mileage scale of rates the same as at present in effect between points in Kansas on Mo. Pac. R. R. and points in Nebraska on Mo. Pac. R. R., for example (rates in cents per 100 lb.):

50 miles and under	3½
100 miles and over 90	6
200 miles and over 175	8½
300 miles and over 275	10½
400 miles and over 375	12
500 miles and over 475	14

Minimum weight 90% of marked capacity of car, except when weight of shipments loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will apply, but in no case shall the minimum weight be less than 40,000 lb. (By shipper.)

5368—**Sand**, carloads, from Wilmington, Ill., to points in Wisconsin and Michigan of which the following are representative:

To	Present	Proposed
Belgium, Wis.	12	10
Menominee, Mich.	16	14½
Ootsburg, Wis.	12	10
White Fish Bay, Wis.	12	10

Minimum weight 90% of marked capacity of car, except that when weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lb. (By shipper.)

5369—**Sand**, carloads, from Kansas City district to Alvord and Mercer, Mo. Present, sand, 8½ cents; gravel, 9 cents. Proposed, sand, 7 cents; gravel, 7 cents.

"Inner Zone" Rate Hearing Ended

HEARING was completed recently in the sand and gravel case, Docket 17817, the Chicago Sand and Gravel Co. et al. against the Santa Fe et al., before Examiner Fuller, at Chicago., after testimony entered by the carriers and by interveners against the complainant.

Rate testimony introduced by C. B. Ackerman on behalf of the complainant, attacked the present level of rates on sand and gravel from inner zone producing points such as Joliet, Spalding, Elgin, South Elgin, Algonquin, Crystal Lake and Wilmot Spur, Illinois, to Chicago. He testified that it was the position of the complainant that the level of rates from these points to Chicago was too high as compared with the level of sand and gravel rates from outer zone producing points such as Rockford, Janesville, Beloit, Afton and Waukesha. He introduced exhibits comparing the return on the rates from both zones and comparing the relationship of sand and gravel to other commodities moving from both the inner and outer zones, tending to show that, from the inner zone, sand and gravel bore a higher percentage of relationship to the general rate srtucture than from outer zone points. He made the point that sand and gravel, taking the movement as a whole, was one of the best paying commodities the carriers handled. What the complainant wanted, he said, was a reduction in the rates on sand and gravel moving within a distance of 40 to 50 miles from Chicago to the market in the Chicago district, and the establishment of a basis of rates in this territory properly related to the level of all rates prevailing in the territory, and that would place shippers on a parity with competitors from the outer zone.

Following the completion of Mr. Ackerman's testimony, the case for Indiana shippers, intervening in the main complaint, was begun. E. Guy Sutton, of the Neal Sand and Gravel Co., Wolcottville, Ind., and with plants at other Indiana points; J. L. Dillard, of the Sturm and Dillard Co., Leland, Ind.; and H. Binns, of the Casparis Stone Co., Logansport, Ind., testified as to the inability of the companies they represented to do business in the volume of several years ago. It was their position that the high freight rates were generally responsible for losses of business, and that it was especially noticeable that the rates caused a loss in volume of business, following the rate increases effective September 10, 1925.

A. F. Cleveland, for the Chicago and Northwestern; O. T. Cull, for the St. Paul; R. Terry, for the New York Central; J. J. Clark, for the C. & E. I.; Fred Crosby, for the Rock Island, entered testimony tending to justify the basis for making rates on sand and gravel in the territory adjacent to Chicago as founded in Jones No. 420. It was the contention of the carrier witnesses that the zone system of making rates for sand and gravel was proper, and that, if it was continued in the Chicago district, all producers of sand and gravel would be on a proper competitive parity, and be able to get to the Chicago district market on one or two line hauls.

E. L. Maynard, for the Brownell Improvement Co., testified for producers of crushed stone in the Chicago switching district. He said that, on account of the short haul on stone in the district, it should have a generally lower rate than sand and gravel, but, on the other hand, there had never been any definite relationship between the sand and gravel rates and those on stone and there was no justification for raising stone rates to the level of rates on sand and gravel.

O. P. Chamberlain, vice-president of the Dolese and Shepard Co., producers of crushed stone, gave testimony to show that there had been a decline in the number of producers of crushed stone as well as in the volume of production. He said there were now 10 plants in the district where there had been 16. He said that, in the last four years, the cost of production had risen something like 28 cents a ton.

Frank H. Cull, for the Chicago Firebrick Co. and the Kenosha Sand and Gravel Co., was opposed to any increase in the rates on sand and gravel.

E. J. Womer, for the Consumers Co., expressed himself as being, in effect, in favor of some readjustment in rates on sand and gravel, but opposed to any increase on sand and gravel.—*Traffic World.*

Missouri Producers Seek Lower Rates into Illinois

HEARING was held on Docket 17789, the Missouri Sand and Gravel Co. against the Burlington and others, before Examiner Fuller at Chicago recently. The complainant sought rates from La Grange, Mo., to points in Illinois in line with rates on sand and gravel from Buffalo and other points in Iowa to Illinois points. The complainant pointed out that rates were generally much higher than rates from Iowa, and, in a number of instances, the rates from La Grange were the class rates. H. Sandborn, of the Lehigh Stone Co., and P. E. McGrath, for Illinois producers of sand and gravel, testified as interveners opposed to the complaint. They pointed out that the market in Illinois was declining, a reason being that the road building program was not as large as it was, and also that there was a heavy production in the state itself.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.65	1.65	1.40	1.40	1.40
Cobleskill, N. Y.	1.50	1.35	1.25	1.25	1.25	.....
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Eastern Pennsylvania	1.35	1.35	1.35	1.35	1.35	1.35
Frederick, Md.	.50	.75	1.30	1.20	1.10	1.10
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Walford, Penn.	.70	1.35	1.35	1.35	1.35	1.50
Watertown, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Afton, Mich.	.....	.....	.50	.....	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo and Linwood, Iowa	1.10	.....	1.10	.90	.95	.95
Chasco, Ill.	1.25	.....	.....	.....	.....	1.15
Columbia, Krause, Valmeyer, Ill.	1.00@1.50	1.20@1.25	1.20@1.25	1.20	1.20	1.50
			Flux 1.50@1.75			
Cypress, Ill.	1.15	1.15	1.15	1.15	1.05	1.00
Greencastle, Ind.	1.30	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Milltown, Ind.	.....	.90@1.00	.75@ .85	.90@1.00	.85@ .90	.85
Northern New Jersey	1.30	.....	1.80	1.60	1.40	.....
River Rouge, Mich.	1.10	1.10	1.10	1.10	1.10	1.10
St. Vincent de Paul, Que.	.75	1.25	1.00	.90	.85	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Stone City, Iowa	.75	.....	†1.10	1.05	1.00	.....
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
SOUTHERN:						
Alderson, W. Va.	.60	1.45	1.45	1.35	1.25	1.20
Allgood, Ala.			Crusher run, fines out, for flux, 1.00 per net ton			
Cartersville, Ga.	.....	1.50	1.50	1.25	1.15	1.10
Chico, Texas	1.00	1.35	1.30	1.25	1.15	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.50	1.60	1.50	1.35	1.25	.....
Graystone, Ala.			Crusher run fluxing stone, 1.00 per net ton			
Henderson, N. C.	.....	.....	1.50	.....	1.25	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
New Braunfels, Tex.	.30@1.00	1.00@1.30	1.00@1.30	.70@1.00	.70@ .90	.....
Olive Hill, Ky.	.50@1.00‡	1.00	1.00	1.00	1.00	1.00
Rocky Point, Va.	.50@1.00	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atkinson, Kans.	.25	2.00	2.00	2.00	2.00	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35e	1.25d	1.20
Cape Girardeau, Mo.	1.25	.....	1.25	1.25	1.10	.....
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Limestone, Wash.	3.00	3.00	3.00	3.00	3.00	3.00
Rock Hill, St. Louis Co., Mo.	1.30	1.15	1.15	1.15	1.15	1.30

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.35	1.25	.....
New Haven, New Britain, Meriden & Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.50	2.00	1.80	1.40	1.40	.....
Oakland and El Cerritto, Cal.	1.00	1.00	1.00	.90	.90	.....
San Diego, Calif.	.....	2.75	2.55	2.35	2.35	.....
Sheboygan, Wis.	1.00	1.10	1.10	1.10	1.10	.....
Springfield, N. J.	1.60	2.00	1.90	1.60	1.60	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.—Granite	.....	.....	1.75	.....	1.50	.....
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Havelock, Ontario	.....	2.60	2.10	2.10	.....	.....
Lithonia, Ga.—Granite	.75	1.75	1.60	1.40	1.35	1.35
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@2.00
Northern New Jersey (Basalt)	1.50	2.00	1.80	1.40	1.40	.....
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Pa. (sand-rock)	1.85@2.00a	.....	1.35@1.50	.....	1.00@1.50	.....
Toccoa, Ga.—Granite	.....	.....	1.60	1.45	1.40	.....

*Cubic yd. †1 in. and less. ‡Two grades. ‖Rip rap per ton. (a) Sand. (b) to ¼ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—90% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	6.00
Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Belfast and Rockland, Me. (rail), Lincolnville, Me. (water), analysis $CaCO_3$ 90.04%; $MgCO_3$ 1.5%, 100% thru 14 mesh, bags	4.50
Bulk	3.50
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; pulverized; 50% thru 50 mesh	1.50
Cartersville, Ga.—Pulverized, 2.25; 90% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Texas.—50% thru 50 mesh, bulk	1.75
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Danbury, Conn., Rockdale and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MgCO_3$; 50% thru 100 mesh; paper bags, 4.25; cloth, 4.75; bulk	3.25
Henderson, N. C. (paving dust)—80% thru 200 mesh, bags	4.25@ 4.75
Bulk	3.00@ 3.50
Analysis $CaCO_3$, 56%; $MgCO_3$, 42%; 65% thru 200 mesh, bags	3.95
Bulk	2.70
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$, 37% $MgCO_3$; 80% thru 100 mesh; bags, 3.75; bulk	2.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 90% thru 100 mesh	3.90@ 4.50
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—50% thru 50 mesh, 2.00; 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis 99.5% $CaCO_3$, 0.25% $MgCO_3$; 50% thru 200 mesh; bags, 3.25@3.50; bulk	2.00
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—50% thru 4 mesh	.50
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh	1.50
Blackwater, Mo.—Analysis, 99% $CaCO_3$; 90% thru 4 mesh	.75
Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50
Chasco, Ill.—50% thru 100 mesh	1.20
Chico, Texas—50% thru 4 mesh; bulk	1.50

(Continued on next page)

Agricultural Limestone

Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.35
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Dundas, Ont.—Analysis, 53.8% $CaCO_3$; $MgCO_3$, 43.3%. 50% thru 50 mesh; bags, $4.75; bulk	3.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Garnet, Okla.—All sizes	1.25
McCook, Ill.—Analysis, approx. 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh	.90
Kansas City, Mo.—50% thru 100 mesh	.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh	1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Piqua, Ohio, sacks, 4.50@5.00 bulk	3.00@ 3.50
Rocky Point, Va.—80% thru 200 mesh; bags, 4.25@4.75; bulk	3.00@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va.—Glass sand	2.25
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass.: 6.00 to 7.00 per ton; bbl	2.50
Columbus, Ohio	1.00@ 1.50
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.25
Gray Summit and Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Mapleton Depot, Penn.	2.00@ 2.25
Massillon, Ohio	3.00
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ottawa, Ill. (Contracts)	1.00
Pittsburgh, Penn.—Dry	4.00
Damp	3.00
Red Wing, Minn.: Bank run	1.50
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.25
San Francisco, Calif.	4.00@ 5.00
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Utica, Ill.	1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio	.75@ 1.50	
Eau Claire, Wis.	.45@ 1.25	
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		1.00*		1.50*	1.75*	
Farmingdale, N. J.	.58	.48	.75	1.20	1.10	
Hartford, Conn.	.65*					
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias Jct., N. Y.		.75	.75		.75	
Montoursville, Penn.	1.00	1.00	1.00	.75	.75	.75
Northern New Jersey	.50@ .60	.50@ .60	1.00@1.25	1.00@1.25	1.00@1.25	
Olean, N. Y.		.75	.75		.75	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Pa.		1.85@2.00		1.35@1.50		
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Attica, Ind.			All sizes .75@.85			
Barton, Wis.		.50		.75	.75	.75
Chicago, Ill.	.70	.50	50	60	.60	.60
Columbus, Ohio		.70	.70	.70	.70	
Des Moines, Iowa	.40	.40	1.50	1.50	1.50	1.50
Eau Claire, Wis.	.45	.45	.80	.90	.90	.90
Elgin, Ill.		.20*	.50*	1.50*	1.50*	1.50*
Elkhart Lake, Wis.	.60	.30	.50	.50	.40	.40
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Haven, Mich.		.50@ .80		.60@ .90		.70@ .90
Grand Rapids, Mich.		.50		.80	.80	.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50		.70		.60
Humboldt, Iowa	.40@ .60	.40@ .60	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50	.50	1.45	1.45	1.45	1.35
Mankato, Minn.	.55	.45		1.25	1.25	
Mattoon, Ill.	.75	.75	.75	.75	.75	.75
Milwaukee, Wis.		1.01	1.21	1.21	1.21	1.21
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.70	.70			1.60	
Oregon City, Ore.		1.25	1.25	1.25	1.25	1.25
Palestine, Ill.	.75	.75	.75	.75	.75	.75
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	1.18	1.45	1.65	1.45	1.65	1.45c
Terre Haute, Ind.	.75	.60	.75	.90	.90	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
Yorkville, Sheridan, Oregon, Moronts, Ill.		.40@ .70	.30@ .50	.50@ .60	.60	.60
Zanesville, Ohio		.70	.50		.80	
SOUTHERN:						
Charleston, W. Va.			All sand, 1.40.	All gravel, 1.50.		
Chattanooga, Tenn.		1.65			1.45	
Knoxville, Tenn.	1.00	1.20	1.20	1.20	1.20	1.20
Lindsay, Texas					.55	
Macon, Ga.	.50	.50	1.00	1.00	1.00	1.00
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.50			1.00	1.00	
WESTERN:						
Kansas City, Mo.	.80	.70				
Los Angeles, Calif. (points all around) (d)	.60	.50	.85	.85	.85	.85
Los Angeles district (bunkers) †	1.50	1.40	1.85	1.85	1.85	1.85
Phoenix, Ariz.	1.25*	1.00*	2.50*	2.00*	1.75*	1.50*
Pueblo, Colo.	.80	.65		1.35		1.20
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*	1.50*	1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Chicago, Ill.	.95					
Dudley, Ky.	1.10	1.00	.90			
East Hartford, Conn.			Sand, .75*			
Ferrysburg, Mich.						.65@1.00
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.60		
Hamilton, Ohio					.70	
Hersey, Mich.				.55		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35					
Lindsay, Texas		.95				.55
Macon, Ga.	.35	.35				
Mankato, Minn.			Pit run sand, .50			
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.	.60					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Shining Point, Penn.			Concrete sand, 1.10 ton			
Smithville, Texas	.50	.50	.50	.50	.50	.54
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Waukesha, Wis.	.60	.60	.60	.60	.60	.64
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

(a) ¾ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job.
(d) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.25	2.00	2.25	1.50		3.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75@2.25	1.75@2.25		1.75@2.25	2.00@2.50	2.00@2.50	
Columbus, Ohio	1.50@2.00	1.50@1.75	2.00@2.50	.30@1.50	1.25@2.00	2.75@4.00	1.25@1.50
Eau Claire, Wis.				1.25		3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Elnora, N. Y.			1.75				
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75	2.00	2.00	2.00		
Joliet, Ill.	No. 2 molding sand; loam for luting and open hearth work—.65@.85						
Kasota, Minn.							1.00@1.25
Klondike, Mo.	1.75		2.00	1.75	1.75		1.25
Mapleton Depot, Penn.	2.00	2.00	2.00	2.00		2.25	
Massillon, Ohio	2.50	2.50		2.50	2.50		
Michigan City, Ind.				.15@ .30			
Mineral Ridge and Ohlton, Ohio	2.00*	1.75*		2.00*	1.75*	1.75*	
Montoursville, P'n.				1.25@1.35			
New Lexington, O.	1.75	1.25					
Ottawa, Ill.		.75@1.00†					
Red Wing, Minn.	1.25		1.25	1.50	1.50	3.50	1.50
Ridgeway, Penn.	1.50	1.50					
Round Top, Md.				1.60			
San Francisco, Calif.	3.50	4.75	3.50	3.50@5.00	3.50@4.50	3.50@5.00	
Tamalco, Ill.		1.40@1.60					
Tamms, Ill.	Ground silica per ton in carloads—20.00@31.00						
Thavers, Penn.	1.25	1.25		2.00			
Utica, Ill.	.60	.75		.75	.75		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.75*@2.25	1.75*		1.75*@2.25			
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Damp. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium nd Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*			1.45*
Jackson, Ohio		1.05*		1.30*	1.30*	1.30*	1.30*
Toledo, Ohio	1.50	1.25	1.50	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55*		1.55*	1.55*	1.55*	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.		.75		1.25	.90	.90	.75

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.20
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95d
Chazy, N. Y.	12.50	10.50	8.00	12.00	11.50	16.50	10.00	2.50_2
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00t
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50			8.50	1.65i
CENTRAL:								
Afton, Mich.					8.50	1.61		
Carey, Ohio	12.50	8.50@9.50	9.50		9.50		9.00	
Cold Springs, Ohio	12.50	8.50	8.50		9.00		8.00	
Delaware, Ohio	12.50	10.00	9.00	10.00			9.00	1.50
Frederick, Md.		10.00	9.50	10.00			7.50	1.45
Gibsonburg, Ohio	12.50							
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio (f)	12.50							
Marblehead, Ohio		8.50	8.50		9.00		8.00	1.50w
Marion, Ohio		8.50	.850				8.00	1.70d
Milltown, Ind.		9.00@10.00		10.00p	8.00_3			$1.60r$
Sheboygan, Wis.	11.50						9.50	.95
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00	8.00	
Wisconsin points (f)		11.50					9.50	
Woodville, Ohio	12.50	8.00	8.00	13.50	9.00	11.00	9.00	1.50
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Tex.							14.00	1.75
Graystone, Ala.	12.50	10.00		12.50			8.50	1.50
Keystone, Ala.	12.00	10.00	10.50	10.00	9.00		8.50	1.50u
Knoxville, Tenn.	20.25	10.00		10.00			8.50	1.50
Ocala, Fla.		13.00	10.00			.80	12.00	1.70
WESTERN:								
Calcite, Colo.							9.25	
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Dittlinger, Tex.		12.00@13.00					9.50p	1.50_4
San Francisco, Calif.	19.50@21.00	18.00@20.00	15.00	18.50			14.00_5	2.00
Tehachapi, Calif.			8.00				13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 180-lb. net barrel 1.65; 280-lb. net barrel, 2.65 (m) finishing lime, 3.00 common; (n) common lime; (o) high calcium; (p) to 10.50; (q) to 8.50; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (x) wood, steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (¶) to 10.00; ($_1$) 80-lb. paper bags; ($_2$) to 3.00; ($_3$) to 9.00; ($_4$) to 1.60. ($_5$) to 16.00.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Gray Summit and Klondike, Mo.		1.75
Mapleton Depot, Penn.	2.00	2.00
Massillon, Ohio		2.25
Mineral Ridge and Ohlton, Ohio	*1.75@ 2.00	*1.75
Montoursville, Penn.		1.25
Ottawa, Ill.	1.25@ 1.50	
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50@ 4.50	3.50@ 4.50
Thayers, Penn.		2.25
Utica, Ill.	1.00	1.00
Warwick, Ohio		2.25
Zanesville, Ohio		2.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point,

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons, per gross	.08 1.25
Chatsworth, Ga.:	
Crude Talc	5.00
Ground (150-200 mesh), bulk	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), bulk	9.00@10.00
Including bags	10.00@11.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bulk	7.50@14.00
Joliet, Ill.:	
Ground talc (150-200) bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300 mesh), bags	12.00@14.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 65-70%	4.50@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 75%	6.00
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	7.25@ 8.25

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	7.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 65%; bulk, 7.25; bags	9.25
Twomey, Tenn.—B.P.L. 65%	7.25

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton,	
68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75
72% min. B.P.L., Basis 72%	4.25
75/74% B.P.L., Basis 75%	5.25
77/76% B.P.L., Basis 77%	6.25

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00@150.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	19.00@ 20.00
Rumney Depot, N. H. — per ton,	
mine run	360.00
Mine scrap	24.00
Clean shop scrap	27.00
Dry ground, 20 mesh	28.00
40 mesh	35.00
60 mesh	40.00
100 mesh	60.00
200 mesh	80.00
Roofing mica	27.00
Punch mica, per lb.	.10

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars		10.50
Brandon, Vt.—English pink and English cream	*11.00	*11.00
Brandon grey	*11.00	*11.00
Buckingham, Que.—Buff stucco dash		‡12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y.—Mica Spar		8.00@10.00
Easton, Penn.—Green, bags included	10.00@20.00	10.00@20.00
Haduam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash		6.00@18.00
Middlebrook, Mo.—Red		25.00@30.00
Middlebury and Brandon, Vt.—Middlebury white		‡9.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Calif. — "Natrock" roofing grits		15.00@20.00
Tuckahoe, N. Y.		12.00
Villa Grove, Colo.		13.00
Warren, N. H.—cement facing (mica), per ton		7.50
Wauwatosa, Wis.		16.00@45.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L.
*C.L. including bags; L.C.L. 12.50.
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk	19.00
Bath, Me.—Color, white; analysis, potash, 12%; 100% thru 180 mesh, bags, 21.00; bulk	18.00
Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% through 60 mesh, bags	16.00
96% thru 150 mesh, bags	23.00
Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk	15.50
Glen Tay Station, Ont., color, red or punk; analysis: K_2O, 12.81%, crude (bulk)	6.00@ 7.50
Keystone, S. D.—Prime white, bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 10.35%; Na_2O, 3.62%; Al_2O_3, 18.71%; SiO_2, 65.48%; Fe_2O_3, .17%; 99% thru 200 mesh, bags included, carloads	22.00
Bulk	20.00
Murphsboro, Ill.—Color, snow white; analysis SiO_2, 64.4%; K_2O, 13%; Na_2O, 2.5%; Fe_2O_3, 0.07%; Al_2O_3, 19.3%; 98% thru 200 mesh, bags	21.00
Bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 68% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Toughkenamon, Pa.—Color, white to light cream; 98% thru 150 mesh, bags, 11.00@13.00; bulk	10.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00
Trenton, N. J.—Crude, bulk	12.00@27.00
99% thru 140 mesh; bulk	16.00
(Bags 11 cents each, non-returnable)	
Wheeling, W. Va.—Color, white; analysis,, K_2O, 9.50%; Al_2O_3, 16.70%; Na_2O, 3.50%; SiO_2, 69.50%; 99% thru 140 mesh, bulk	19.00

Blended Feldspar
(Pulverized)

Tenn. Mills—Bulk	16.00@20.00

Chicken Grits

Afton Mich. (limestone) per ton	10.00
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt., per ton	12.00‡
Centerville, Iowa (gypsum) per ton	18.00
Chico, Texas (limestone), 100 lb. bags, per ton	8.00@ 9.00
Los Angeles Harbor (limestone), 100-lb. sack, 1.00; sacks, per ton, 8.50@ 9.50†; bulk, per ton	6.00@7.00†
Toughkenamon, Pa.—(Feldspar) 100-lb. bags, 1.00; bulk, per ton	10.00
Danbury, Conn., Rockdale and West Stockbridge, Mass. — (Limestone) bulk	7.50@9.00*
Gypsum, Ohio.—(Gypsum) per ton	10.00
Limestone, Wash. (limestone) per ton	12.50
Rocky Point, Va. (limestone) 100 lb. bags, 75c; sacks, per ton, 6.00 bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	12.50
Warren, N. H.—(Mica) per ton	7.80
Waukesha, Wis.—(Limestone), per ton	8.00

*L.C.L.
†Less than 5-ton lots.
‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass	14.50
Brighton, N. Y.	*19.75
Dayton, Ohio	12.50@13.50
Detroit, Mich.	14.13
Farmington, Conn.	17.00
Flint, Mich.	¶12.50@16.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	*20.00
Jackson, Mich.	13.00
Lancaster, N. Y.	13.00
Madison, Wis.	†a14.00
Michigan City, Ind.	12.00
Milwaukee, Wis.	*13.00
Minneapolis and St. Paul, Minn.	11.25
New Brighton, Minn.	10.00
Pontiac, Mich.	11.00@12.00
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.00@12.50
Sebewaing, Mich.	12.00
Syracuse, N. Y.	18.00
Terra Cotta, D. C.	13.50
Toronto, Canada	12.00
Wilkinson, Fla.-White	12.00

*Delivered on job. †Delivered in city limits.
‡Less 5%. ¶Dealers' price. (a) Less 1.00 E.O. M. 10 days.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.		3.47
Atlanta, Ga.		2.35
Baltimore, Md.		1.70@2.35
Birmingham, Ala.		2.30
Boston, Mass.		1.81@2.63‡
Buffalo, N. Y.		1.67@2.38‡
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.34
Charleston, S. C.		2.35
Cheyenne, Wyo.	.82¼	3.31
Cincinnati, Ohio		2.37
Cleveland, Ohio		2.29
Chicago, Ill.		2.10@2.60
Columbus, Ohio		2.34
Dallas, Texas		2.10
Davenport, Iowa		2.29
Dayton, Ohio		2.38
Denver, Colo.	.66¼	2.65
Detroit, Mich.		2.15‡
Duluth, Minn.		2.09
Houston, Texas		2.60
Indianapolis, Ind.		2.29
Jackson, Miss.		2.60
Jacksonville, Fla.		2.35
Jersey City, N. J.		1.85@2.33
Kansas City, Mo.		2.02@2.42
Los Angeles, Calif.	.61†	2.44†
Louisville, Ky.		2.27
Memphis, Tenn.		2.80@3.00
Milwaukee, Wis.		2.25
Minneapolis, Minn.		2.32@2.72
Montreal, Que.		1.90
New Orleans, La.		2.20
New York, N. Y.		1.77@2.25‡
Norfolk, Va.		2.17
Oklahoma City, Okla.		2.86
Omaha, Neb.		2.76
Peoria, Ill.		2.27
Philadelphia, Penn.		1.85@2.41‡
Phoenix, Ariz.		3.70
Pittsburgh, Penn.		2.09
Portland, Colo.		2.80
Portland, Ore.		3.20
Reno, Nevada	.75¼	3.01
Richmond, Va.		1.69@2.44
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.31‡
Savannah, Ga.		2.50
St. Louis, Mo.	.55	2.20‡
St. Paul, Minn.		2.32
Seattle, Wash.	10c discount	2.65
Tampa, Fla.		2.60
Toledo, Ohio		2.20
Topeka, Kans.		2.65
Tulsa, Okla.		2.73
Wheeling, W. Va.		2.17
Winston-Salem, N. C.		2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra.
‡Ten cents less to dealers.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.		1.85
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.05
Detroit, Mich.		2.15
Hannibal, Mo.		2.05
Hudson, N. Y.		2.05
Leeds, Ala.		1.95
Mildred, Kans.		2.35
Nazareth, Penn.		1.95
Northampton, Penn.		1.95
Richard City, Tenn.		2.05
Steelton, Minn.		1.90
Toledo, Ohio		2.20
Universal, Penn.		1.85

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ½x32x 36". Wt. 1500 lb. Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Detroit, Mich.‡	.....	.....	.....	11.30	11.30	11.30	.....	8.00	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	..... 8.25@9.40		.....	.....	.14½s	.15½s	40.00@41.00
Douglas, Ariz.	.....	.....	7.00	.....	.....	15.50d	18.50	.....	30.00	15.50	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio‡	3.00	4.00	6.00	9.00	9.00	9.00	19.00	7.00	27.00	20.00	.....	15.00	30.00
Hanover, Mont.	.....	.....	.....	11.80	.....	.....	.....	.....	.....	.....	.....	.....	.....
Los Angeles, Calif.	.....	.....	.....	10.30k	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.50	.....	11.00	16.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (f) delivered; (h) delivered in six states; (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O.B. N. Y. C. and dealers yard in mill locality.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Columbus, Ohio	.16@.18a	.....	.....
Detroit, Mich.	19.00‡	.....	28.00‡
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	.16	.....	.....
Graettinger, Iowa	.18@.20	.....	.....
Indianapolis, Ind.	.14@.16†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	.18@.21a	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Pa.	.20@.22	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate Red and Orange	Yellow, Tan Green and Blue	Slate Gray
French and Spanish†	$11.50	$13.50	$12.75
Ridges (each)	.25	.35	.30
Hips	.25	.35	.30
Hip starters	.50	.60	.60
Hip terminals, 2-way	1.25	1.50	1.50
Hip terminals, 4-way	4.00	5.00	5.00
Mansard terminals	2.50	3.00	3.00
Gable finials	1.25	1.50	1.50
Gable starters	.25	.35	.30
Gable finishers	.25	.35	.30
*End bands	.25	.35	.30
*Eave closers	.06	.08	.06
*Ridge closers	.05	.06	.05

*Used only with Spanish tile. †Price per square.

Houston, Texas.—Roofing Tile, per sq.	
Red	17.00
Green	19.50
Indianapolis, Ind.—9"x15"	
Gray	10.00
Red	11.60
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich. — 5"x8"x12", per M	55.00
Detroit, Mich.—5x8x12, per 100	8.50
Longview, Wash.—(Stone Tile)	Per 1000
4x6x12	55.00
4x8x12	65.00
Mt. Pleasant, N. Y.:	**Per 1000**
5x8x12	78.00
Grand Rapids, Mich.:	**Per 1000**
5x8x12	70.00
Houston, Texas:	
5x4x12 (Lightweight)	45.00
5x8x12 (Lightweight)	80.00
Pasadena, Calif.—(Stone Tile	Per 100
3½x4x12	3.00
3½x6x12	5.00
3½x8x12	6.00
Wildasin Spur, (Building Tile) Los Angeles, Calif.:	Each
4x3½x12	.03½
6x3½12	.04½
8x3½x12	.05½
Yakima, Wash.—Building tile:	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa drain tile per 100 ft.	
5-in.	4.50
6-in.	5.60
8-in.	9.00
10-in.	12.00
12-in.	17.50
14-in.	25.00
16-in.	35.00
18-in.	45.00
20-in.	60.00
22-in.	70.00
24-in.	80.00
30-in.	100.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	9.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	20.00	.....
Milwaukee, Wis	15.00	30.00@50.00
Mt. Pleasant, N. Y.		**14.00@23.00**
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	12.50	
Philadelphia, Penn.	†15.25	‡21.50
Portland, Ore.	17.00	25.00@75.00
Prairie du Chien, Wis.	14.00	22.50
Rapid City, S. D.	18.00	25.00@40.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Wauwatosa, Wis.	14.00	20.00@42.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

†Gray. ‡Red.

Shearman Company to Build Concrete Pipe Plant at Shreveport

A RECENT announcement in the Shreveport, La., *Journal* states that the Shearman Concrete Pipe Co., Knoxville, Tenn., is to establish a large branch concrete pipe plant at Shreveport. The new plant will serve Louisiana, southern Arkansas and eastern Texas.

The plant will be located on a 5-acre site adjoining the new Texas and Pacific railway terminal. An option on additional adjoining acreage, to be used in case expansion is necessary, is said to have been also obtained. The report says that orders for $250,000 worth of machinery have been placed and that the plant will be in operation within a short time.

The Shearman Concrete Pipe Co. is one of the largest reinforced concrete pipe manufacturers in the country and operate plants in 16 states. Recently the company is reported to have sold several of its plants east of the Mississippi and in Arkansas and Texas (ROCK PRODUCTS, May 1 issue). A. N. Shearman is president and R. S. Lander, secreary and manager of the company.

New Sand and Gravel Plant to Have Ready-Mix Concrete Unit

CONSTRUCTION of a complete modern sand and gravel plant, together with a central concrete mixing plant, has been started recently by the Dorman-Kampe Co. at Vancouver, Wash.

Among the machinery to be installed at the plant in addition to the bunkers and concrete mixer will be crushers, washers and screens. Sand and gravel will be obtained from the bars lying above the river and the river bed itself. Both concrete sand and plaster sand will be made. All equipment will be driven by two electric motors, one of 130 h.p. and the other of 30 h.p., which are to be installed.

The concrete mixing plant is said to be the first of its kind in the locality and consists of an innundator and a 1-yd. mixer. Specially built trucks will be used to make deliveries. The new plants are expected to be in operation within a short time and will be under the supervision of B. L. Dorman, one of the owners.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								$14.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
G'd Rapids, Mich. (b)	.....	.....	.....	.60	.72	1.00	1.28	.....	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Houston, Texas	.....	.19	.24	.43	.55½	.90	1.30	.....	†1.70	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.							Sewer pipe 40% off list, culvert—list										
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Olivia & Mankato, Minn.												12.00 per ton					
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Pa.	.....	.....	.....	.....	80[1]	1.00[2]	1.40[3]	.....	.....	2.00[4]	.....	3.25[5]	4.00[6]	6.00[7]	.....	.....	.....
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	.....	3.40	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Waukesha, Wis.								12 in. to 60 in. 18.00 per ton									
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced.
†21-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08. [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Hollow Sand-Lime Brick Successfully Made in Europe*

German Press Said to Solve the Problem of Lighter, Cheaper Building Unit Which Requires 25% Less Material

CONSIDERABLE research in Germany has been devoted to the production of light weight hollow sand-lime brick or building tile. Of late the firm of Bernhardi & Son of Eilenberg, Germany, after years of work has produced a lightweight hollow brick. In this brick hollow spaces are rows

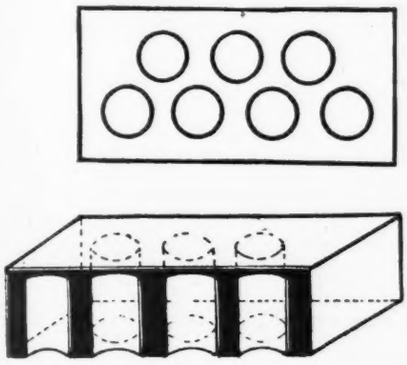


Fig. 1. Side and top views of hollow sand lime brick, showing the method of staggering the holes

of small cylindrical cavities. In this design, there is provided cohesive strength transversely and lengthwise of the brick, which is sufficient to allow removal of the green brick from the press table and their piling on the hardening cylinder trucks.

A regular solid sand-lime brick weighs on an average 8 lb., and a hollow brick of the same dimensions after the heaviest pressing weighs slightly over 6 lb., or from 22 to 25% less. By careful selection of the quality of lime and sand used in manufacture it is possible to make the brick even lighter, and in consequence effect an even greater saving on the cost of manufacture.

*Translated from *Tonindustrie-Zeitung.*

In the process of hardening, the steam, because of the hollow spaces, penetrates throughout the mass more quickly so that the hardening proceeds at a faster rate. In Eilenberg it is said that complete hardening and full strength has been obtained on the hollow brick after 6 hours exposure in the steam cylinders. Since the quality of the raw materials used in making brick varies and affects the time of hardening, other bricks may require more or less time.

Tests on hollow sand-lime brick show that their compressive strength is quite comparable to that of similar brick made of clay.

Sand-lime brick manufacturers have always desired to increase the size and strength of the brick and at the same time lower its specific gravity. It is quite possible that the size of the brick will be increased, thus making possible great savings in the time and cost of putting them in place. The new type has a great future and is destined to open a new sales market for sand-lime brick manufacturers.

Detail of Special Press

The manufacture of the hollow brick is carried on on a revolving table press equipped with a two-section plunger press patented by Dr. Bernhardi, which presses the brick and pushes it out of the press. Figs. 2 and 5 show the parts of the plunger press and the methods of operation. Fig. 2 shows the plungers of the press in position, previous to the addition of sand-lime mixtures. Parts of the plungers act as cores. Fig. 3 shows the same press after the form has been filled. Fig. 4 shows the position of the plungers after pressing and in Fig. 5 is shown the pressed hollow brick ejected from the press.

The plungers are easily removed for cleaning and are also easy to replace in position. These presses are provided with means of removal of excess material so as to eliminate wear from this excess on the movable parts.

Some Physical Properties of Sand-Lime-Brick

AN investigation to determine the strength of the bond between mortar and sand-lime brick is now being conducted by the U. S. Bureau of Standards. The problem in part consists of a study of the effect of various physical properties of the brick, such as total absorption, rate of absorption, density (including pores), specific gravity of solids in the brick, and rate of drying, upon the adhesion of the mortar to the brick. Consequently these properties have been determined upon 1325 individual bricks, representing the product of eight manufacturers. Some very interesting relationships have been found to exist, including the following:

When sand-lime brick are immersed in water, those of the highest total absorption show the most rapid rate of absorbing water at the start, and they are the first to approach a condition of saturation; the limit of their capacity for absorbing water is nearly reached in 12 hours, and very little more water is absorbed if the immersion is continued for seven days. At the end of seven days' immersion sand-lime bricks contain on the average 4% less water than when boiled for five hours. The rates of absorbing water sometimes vary more between bricks of one make than between the average rates of bricks of two makes.

The specific gravity of the solids in sand-lime bricks is so nearly the same that one can locate a smooth curve by plotting the points which represent the total absorption and the density (including pores) of a number of bricks. Such a curve can be used in determining the total absorption of other sand-lime bricks without the use of water merely by determining the density of each.

Bricks which are more porous dry out a little faster than those less porous and retain less water when air dry, which amount varies from 0.5 to 1.0% or more of water, depending upon the material of the brick and the relative humidity.—*News Bulletin* of the U. S. Bureau of Standards.

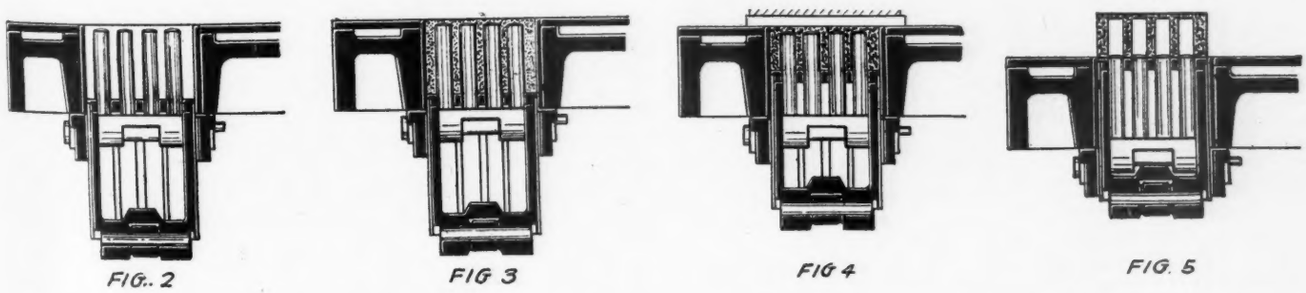


Fig. 2. Plungers in position previous to addition of sand-lime mixture. Fig. 3. Press and plungers after filling. Fig. 4. The lower press section is forced up and a back pressure plate automatically closes over the top surface and the green brick is made. Fig. 5. Finished brick ejected and the press back to its original position, as in Fig. 2

New Machinery and Equipment

New Three Speed Hoist

THE Mundy Sales Corp., New York, announce the development of a new hoist fitted with a sliding gear transmission, enabling the operator to hoist with three different speed ratios. The sliding gear transmission is similar to that used in automobiles and motor trucks. The hoists are for either gasoline or electric power and are said to be particularly adaptable to quarry work, etc.

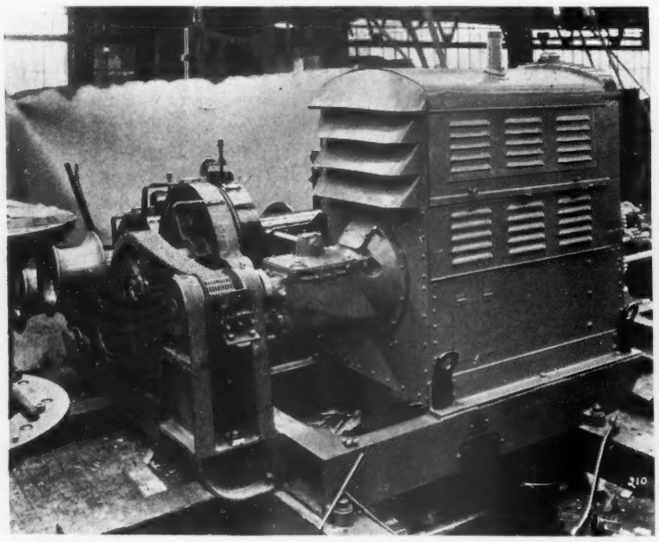
The introduction of a gear box or sliding gear transmission with the hoist is said to enable the hoist to handle average loads at a more economical speed. The operator has at his command three different line pulls and speed ratios and this speed and line pull change can be accomplished, it is said, in a shorter time than otherwise required and eliminates the necessity of handling all loads at the same speed.

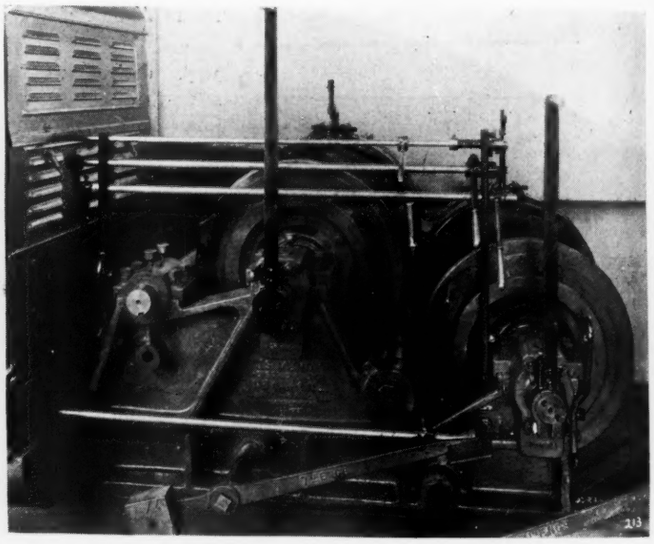
The hoist, all gear shift and clutch levers are so mounted that the operator does not have to move from his operating position to change speeds. In the case of the gas engine unit, he has only to move when cranking the engine. This hoist is built in units of 20 to 100 hp. and contains asbestall frictions and other features of regular Mundy hoists.

On the 60 hp. three speed hoist, a slow speed of approximately 140 ft. per minute with a line pull of 9000 lb.; intermediate speed, 210 ft. per minute; line pull, 6000 lb.; high speed, 265 ft. per minute; line pull, 4500 lb. is said to be obtained. The following gives details of speeds, line pulls, etc.

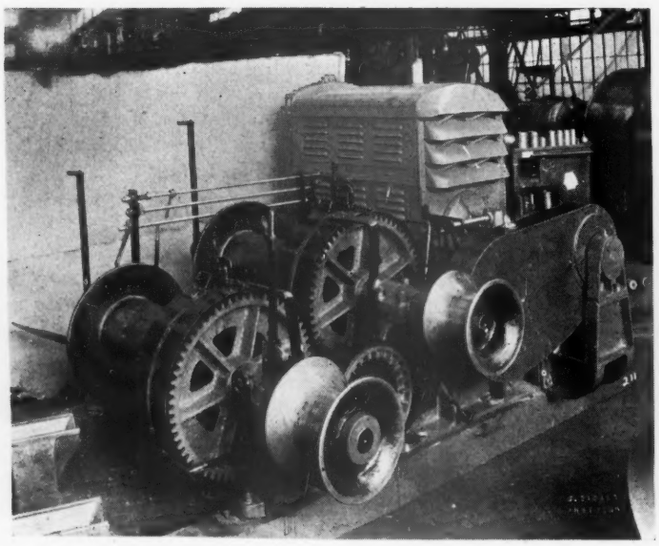
60 HP., 3-SPEED HOIST

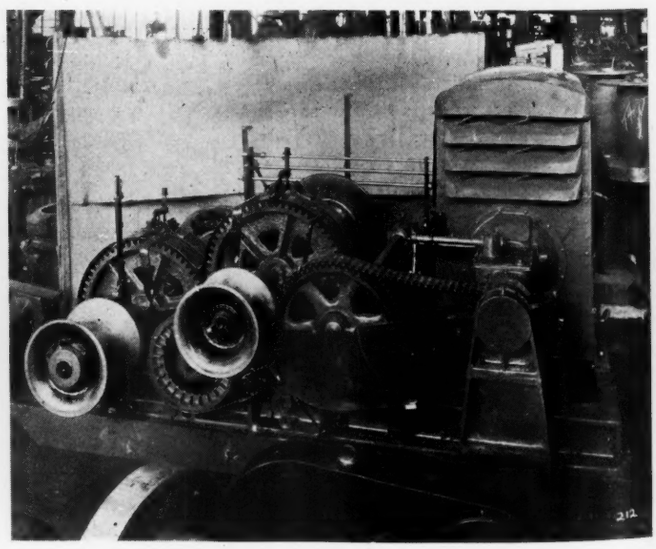
Slow speed, 550 r.p.m.	Drive shaft		⅝-in. rope
First lap.....	⅝	140 ft. min.	10,000 lb. pull
Third lap.....	⅝	160 ft. min.	8,750 lb.
Fifth lap	⅝	180 ft. min.	7,800 lb.
Seventh lap....	⅝	198 ft. min.	7,100 lb.
Int. speed, 820 r.p.m.	Drive shaft		
First lap	⅝	210 ft. min.	6,700 lb.
Third lap.....	⅝	240 ft. min.	5,800 lb.
Fifth lap	⅝	270 ft. min.	5,200 lb.
Seventh lap....	⅝	296 ft. min.	4,750 lb.
High speed, 1050 r.p.m.	Drive shaft.		
First lap.....	⅝	265 ft. min.	5,200 lb.
Third lap.....	⅝	305 ft. min.	4,530 lb.
Fifth lap.....	⅝	345 ft. min.	4,000 lb.
Seventh lap....	⅝	378 ft. min.	3,640 lb.
Slow speed, 36.4 r.p.m.	Drum shaft		
First lap	¾	140 ft. min. ×	10,000 lb.
Third lap.....	¾	164 ft. min. ×	8,550 lb.
Fifth lap	¾	188 ft. min. ×	7,450 lb.
Seventh lap....	¾	213 ft. min. ×	6,600 lb.





Motor side and drum side of three-speed hoist

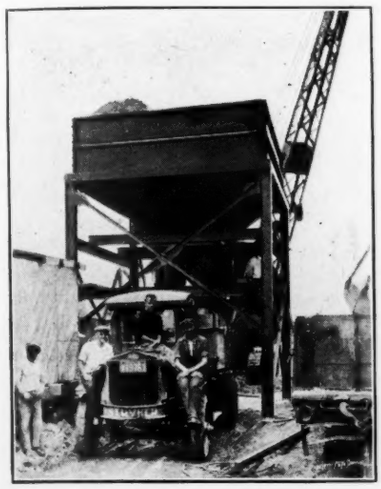




Two views of the sliding gear and silent chain transmission of three-speed hoist

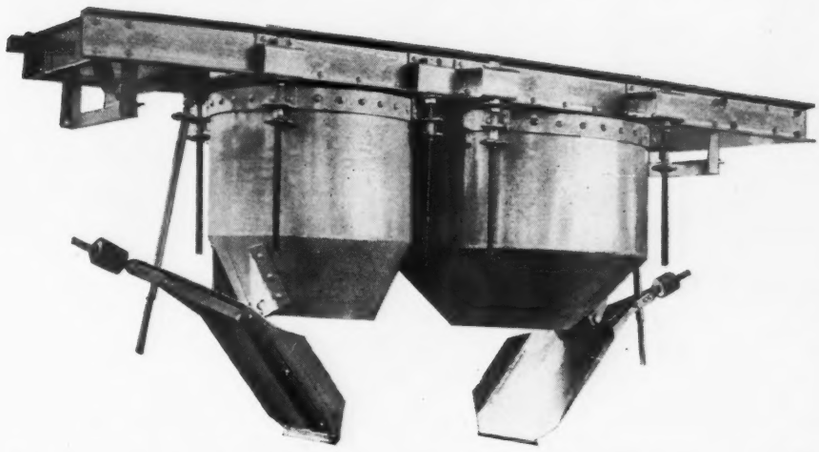
New Single Control Measuring Batcher

A NEW single control batcher operated by a single lever, which is said to perform the complete operation of filling, cutting off, dumping the batch of sand and stone, closing the lower and opening the upper gates in a fraction of a minute, has been recently brought out by the Hetzel Steel Form and Iron Co., Warren, Ohio. The upper and lower gates automatically interlock, so as to produce, it is claimed, accurate and uniform batches. Provisions have been made, it is said, for quick and accurate adjustment to compensate for bulking.



Measuring batcher attached to a bin as used in stone, sand and gravel plants

The sand batcher is of standard capacity adjustable from 8 to 14 cu. ft. and is round in cross section. The stone batcher is also round and has a standard capacity adjustable from 13 to 28 cu. ft. Both are equipped with loading indicators to show when full or empty. The batcher frame is a self-contained unit built of channel steel iron with all operating parts attached to the frame. The upper gates are of 14-in. diameter openings with a slide cut off that rolls on line-point wheels. The lower gates have 18-in. openings and are of the drop chute type interlocking with the upper gates, operated by a single control lever.



New measuring batcher whose entire operation is controlled by a single lever The upper and lower gates interlock

The batcher's overall height, adjusted to 13 cu. ft. capacity is 3 ft. and for the 28 cu. ft. capacity is 4 ft. 8 in. The batcher frame is drilled for attachment to practically any type of bin, steel, or wood. The batcher is shipped completely assembled for immediate operation and its shipping weight is about 1400 lb.

New Shovel for Underground Quarrying

A NEW type of power shovel, operating on compressed air, designed particularly for underground loading, has been announced by the Nordberg Manufacturing Co., Milwaukee, Wis. The Butler shovel, as it is known, is equipped with a ¼-yd. dipper and is of the full revolving type. Under ordinary conditions, it is said, that a capacity of 15 to 30 tons per hour can be obtained.

Because of its compact design, it can be used in drifts 5½x7 ft., while its clean-up of 18 ft. 6 in. makes it suitable for use in large tunnels, stopes, and rooms. It is said to be able to dig below grade in any direction and load in cars 48 in. or higher if necessary. The outstanding features of this shovel that are claimed by the manufacturers are its light weight (4000 lb.), strength, simplicity of design, and low cost as compared with other shovels for similar purposes. Operation costs are also said to be economical, for the shovel is said to require only 135 cu. ft. of air per minute at 70 to 90 lb. pressure.

Specifications

Height required*	6 ft. 5½ in to 8 ft.
Car clearance*	3 ft. 6 in. to 5 ft.
Dumping radius	6 ft. 9 in.
Digging radius	9 ft. 3 in.
Crowding radius	6 ft. 10½ in.
Minimum height when revolving	6 ft. 5½ in.
Swinging radius—dipper 8 in. above rail	4 ft. 3 in.
Length of cage required for hoisting	4 ft. 4 in.
Height above rails up to	5 ft.
Revolving radius dipper up	2 ft. 8½ in.
Distance required between car and roof	3 ft.
Traveling clearance	3 ft. 10½ in.
Width operator's platform	1 ft.
Traveling clearance with platform unshipped up to 24-in. gage—above that add 12 in. to track gage	2 ft. 10¼ in.

*Depending on height of car.

Left—Dipper of compact shovel in starting position. Right—Distributing the load in the car. The operator can move the dipper the length of the car while discharging

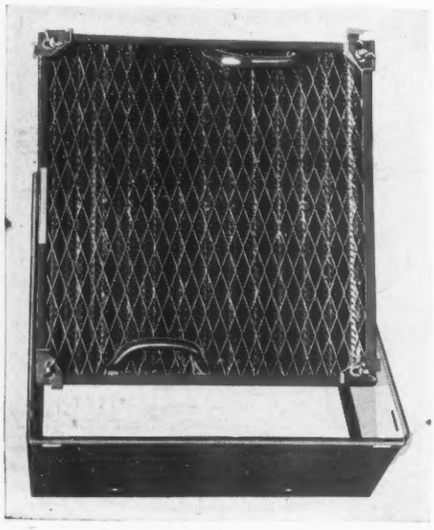
Air Filters in Rock Products Industries

For the Protection of Compressors, Gas and Oil Engines, Air-Cooled Generators, Etc., and for Sanitary Reasons

By Wm. B. Spooner, Jr.,
Chemical Engineer, New York City

PROBABLY most readers are familiar with the growing practice of automobile manufacturers of equipping carburetors with air filters. The same arguments for clean air apply to numerous pieces of machinery, even the heavy rugged types of equipment used in the rock products industry.

This refinement of operation is entirely distinct from dust collection and prevention, primarly designed to recover dust which can be used either as raw material or finished product. Air filters are designed to keep dust out of mechanisms, the lives of which are materially shortened by such dust. Chief among these applications is that of protecting equipment, such as air compressors, turbo-generators, mill motors, internal combustion engines, etc., against dust damage.



Typical unit of a recent patented type of air filter

Consider the air compressor and internal combustion engine operated in dusty air. Every stroke of the piston pulls in its quota of dust, which combines with the lubricating oil to form a gritty abrasive paste. Cylinders and valves are worn, with resultant loss of power and capacity, not to mention the necessity for frequent re-grinding or replacement of valves, and the re-boring of cylinders.

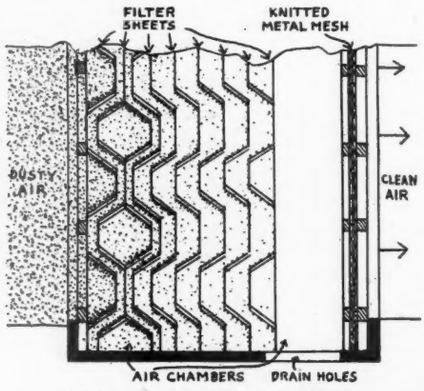
Every plant superintendent operating an air compressor or internal combusion engine in dusty air has had trouble with "sticking" valves, and knows he has to shut down his equipment periodically to clean out dust deposits (and he usually finds a considerable "carbon deposit" (so called) which is really a further dust deposit mixed with carbonized oil). As a matter of fact, if this equipment is operated on clean air, there is a material saving in lubricating oil consumption, amounting to more than 50% in most cases.

Electric Equipment Needs Clean, Cool Air

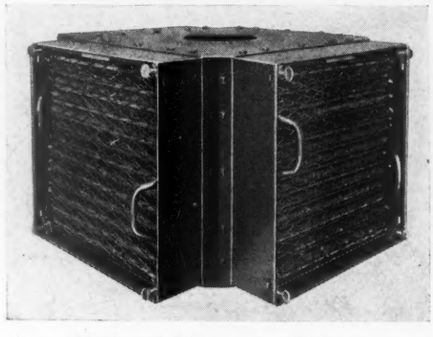
Where electric power is generated in the plant, turbo-generators must be supplied with clean cooling air, if the full capacity of this equipment is to be obtained. Dust clogged air passages and windings lead to local overheating, which has time and again caused burn-outs, which in many cases have totally ruined generators. Short circuits due to dust deposits are far from uncommon.

In those plants which buy power, but operate their own substations, the need for clean air is fully as imperative. Motor generators, convertors, condensers, and similar rotating equipment need clean cooling air. Switchboards, bus bar galleries, reactor coils, storage-battery rooms, circuit breakers, and similar substation equipment need clean air to insure steady, uninterrupted operation, and to eliminate costly cleaning schedules, which often involve a hazard to personnel.

Laboratories, drafting rooms, offices, and similar departments of the plant frequently suffer from the effects of dust, and the dust-collecting systems available for the plant proper are not capable of solving the problem. Air filters are designed to eliminate dust from such rooms and buildings.



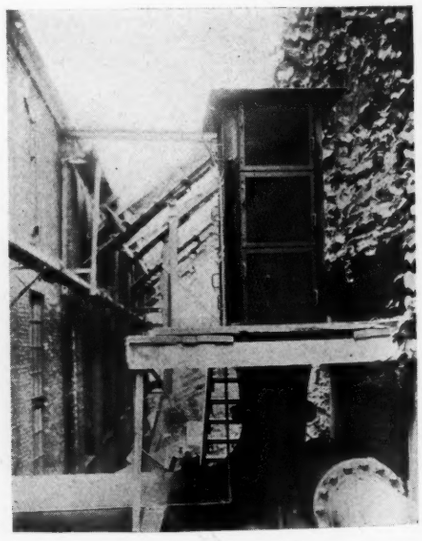
Cross-section of the filter shell shown above



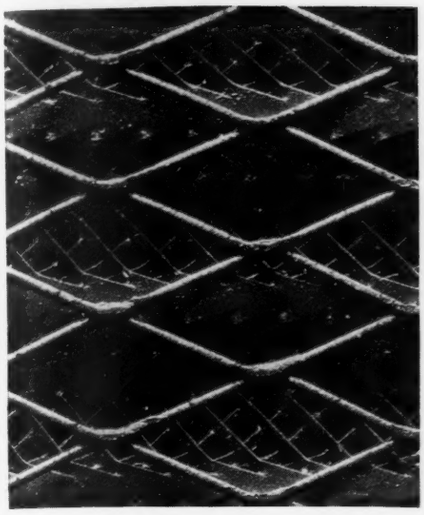
Assembled unit of the installation shown at the right

Unit Type of Air Filter Comparatively New

Air filters, as opposed to the older methods of providing clean air, are comparatively new. The first type introduced (the Midwest air filter) has been greatly improved since its appearance in 1921. Instead of depending on the principle of screening, this air filter operates on an entirely different principle. The present design is, like the original type, built up on a unit system. Each filter unit consists of a frame and a filter cell, completely interchangeable with all other cells and frames.



Air filter installation at a portland cement plant



Showing close-up of clean screen exterior

The filter cell consists of a metal box, 19½ x 19½ x 4 in., in which are located the filter media. These filter media consist of a series of specially corrugated and perforated metal sheets, arranged one behind another through the depth of the cell, and in addition, at the rear of the cell, of a few thicknesses of knitted flat metal ribbon, designed to function like the filter sheets, but for the purpose of intercepting the very fine dust particles which might pass by the filter sheets.

These filter sheets and the knitted metal mesh are coated with a heavy, viscous non-inflammable and non-evaporating oil. When dusty air is forced by a fan or blower, or by the suction of an air compressor or engine, through the filter cell, it is forced to change its direction innumerable times, as it passes through the filter media. Each time a dust particle is impinged against the sticky surface of a filter sheet, it is held. By the time the air current has passed through the cell all harmful dust has been removed.

There are such ample spaces between the successive filter sheets, and such liberal openings in the filter sheets themselves, that a large dust capacity is provided per cell, without any possibility of the clogging effect, and the increased resistance experienced with any filter depending on the screening principle.

The unit system of installation allows any conditions of space and capacity to be met. For large capacities, the number of units required (each with a capacity of 800 c.f.m. or more) to supply the air needed, is assembled in an angle iron frame to suit the layout of the space available. An installation is made air-tight and leak-proof by an interlocking frame, and by the seating of the cells in the frames. All air must pass through the cells.

With certain equipment, where capacity requirements are less, one or more standard cells are mounted in a box made up of assembled frames, or smaller types of filters, based on the same design and principle, are available.

Filter Cells Easily Cleaned

The cleaning of a cell is a simple matter. The dirty cell is removed from its frame and replaced with a clean, charged cell. The cell is then washed in hot water and soda in a special washing tank provided for the purpose. After draining, it is dipped in a viscous oil and drained again. It is then ready to be used as a spare cell when the next dirty cell is cleaned. It takes only a few minutes to clean a cell, and only a cell or two is cleaned per day on the average installation. Since these filters are all metal and coated with oil, they last indefinitely.

The use of air filters to supply clean air to laboratory buildings, cafeterias, offices, plant dispensaries, and even many working departments is quite common, wherever the dust collector proper is not adaptable.

Close-up of screen after use

Washed Gravel Ballast

WHERE river gravel consisting largely of waterworn pebbles is used as ballast, what can be done to improve the line-holding qualities of the ballast?

Use a Liberal Percentage of Sand or Crush the Larger Pebbles

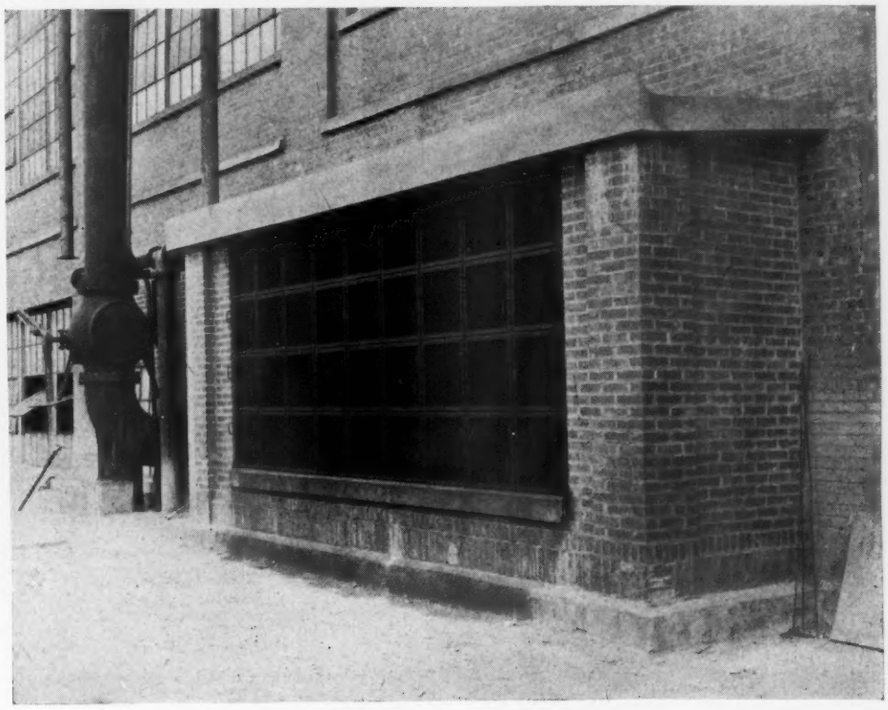
By W. S. Hanley, Chief Engineer, St. Louis Southwestern, Tyler, Texas

Where river gravel is used consisting largely of waterworn pebbles the aggregate should contain about 40% of sand and a liberal cross-section should be employed; sufficient rail anchors should be applied and slot spiking eliminated. Where the aggregate is deficient in sand, it is advisable to run the larger sizes through a crusher.

Use Sand or Cinders to Fill the Voids

By Engineer of Maintenance

River gravel used for ballast is usually run over a washing table to remove an excess of sand and then over a screen to remove the larger pieces. Where the pebbles are so waterworn as to be deficient in line-holding qualities, a sufficient amount of sand should be left in to fill the voids between the pebbles. If the gravel does not carry enough sand naturally for this purpose, coarse sand from other sources, if available, may be distributed with the gravel. If the gravel contains a sufficient proportion of large pieces it will often be found economical to run them through a crusher as they come from the screen, the angularity of the crushed particles aiding materially in holding line. — *Railway Engineering and Maintenance.*



Typical power plant air-filter installation

News of All the Industry

Incorporations

Bay Sand & Gravel Co., Detroit, Mich., $50,000.

New York Artificial Stone Co., Inc., Wilmington, Del., $500,000.

Standard Gypsum Co., Wilmington, Ill., $1,000,000. (Corp. Service Co.)

Portland Gravel Co., Portland, Ore., has increased its capital stock to $154,000.

Bonsack Stone Co., Roanoke, Va., $50,000. A. C. Hopwood, Mountain Trust Bldg.

Highland Park Sand Co., Richmond, Va., $50,000. J. A. Saunders, 1604 Grove Ave., Richmand.

Johnson-Hudson Gravel Co., Inc., Carrollton, Mo., $60,000. E. C. Johnson, C. B. Withers and others.

Tri-State Concrete Products Co., Cumberland Gap, Tenn., $50,000. J. E. Gervin, 230 W. Clinch St., Knoxville, Tenn.

Hennepin Sand & Gravel Co., Minneapolis, Minn., $50,000. L. P. McNally, 3142 Emerson Ave., S., and others.

Interstate Rock & Crusher Co., Kansas City, Mo., $50,000. A. J. Foster, Hugh B. Downey, 407 Rialto Bldg., and others.

Ainslie Lime Rock Co., Macon, Ga., $500,000. A. B. Kissack, B. E. W. Stout, L. W. Harlow, A. W. Frazier and others.

Associated Gravel Co., San Francisco, Cal., $600,000. R. Sweeney, M. E. Jones, A. DeMartini, G. Connors and H. T. Beverly.

Haines Bros. Sand Block Co., Camden, N. J., $125,000. W. H. and R. Haines, C. Braddock and B. McFerren. (Atty. Frank Voigt, Camden.)

Peck-Thompson Sand Co., Kansas City, Mo., $20,000. F. W. Peck, 501 Knickerbocker Apt., Kansas City, F. C. Peck, H. B. Thompson and R. E. O'Brien.

Delaware Moulding Sand Co., Newark, N. J., $30,000. C. P. Lyman, H. D. Burroughs and H. W. Wemple. (Atty. H. W. Wemple, Elizabeth, N. J.)

Dumont Quarries Co., New York, N. Y., 400 shares common of no par value. T. A. Kane, M. M. Cronin. (Atty. I. W. Goodhue, 140 Nassau St., New York).

F. W. Sterrett, Hornell, N. Y., $40,000. K. L. Pierce, J. Schwartz and W. Tappenden. To mine and deal in sand. (Atty. C. L. Earley, Andover, N. Y.)

Palumbo Bros. Concrete Block Co., Rochester, N. Y., 500 shares of $100 par value and 250 common, no par. A. and C. and A. Palumbo. (Attys. Bly and Bly, Rochester.)

Quarries

Federal Crushed Stone Co., Minneapolis, Minn., has changed its name to Minnesota Quartzite Co. A. L. Jepson of Minneapolis is president, A. F. Berglund is secretary-treasurer and W. G. Wright, plant superintendent.

E. N. Rynearson and others have leased the quarry of the Bartlett Quarry Products Co., near Litchfield, Ill., and will put it into operating condition for the production of concrete aggregate and agstone. The company name will be changed to Litchfield Quarry Co. and E. S. Rynearson will be general manager.

Dolese and Shepard Co., Chicago, Ill., have moved their general offices from 108 S. LaSalle street, to 1153 Conway building.

Sand and Gravel

Energy Coal and Supply Co.'s gravel plant at Keener, Mo., was damaged by recent fire of unknown origin. The loss is estimated at between $4,000 and $5,000. Work of rebuilding the plant will be started at once.

Cement Products

Deer Creek Stone Quarries Co., Topeka, Kansas, is reported to be planing the erection of a cement block plant at Alamo, Tex.

Jackson Centre Cement Block Co.'s plant near New Brenner, Ohio, was damaged by fire to the extent of about $10,000.

Personals

John W. Ramsay, after an association of 22 years with the Nazareth Cement Co., has terminated this connection to engage in mason's supplies business for himself at his old location at 161 Devonshire St., Boston Mass. Mr. Ramsay started in this line in 1902 with foreign cements and in 1904 went with the Charles Warner Co., who were distributors for Nazareth Cement. In 1908 he opened a Boston office for them and in 1912 after the Warner company withdrew, continued with the business as before until the present change.

Allen L. Darr has purchased the interest of Elmer Childers in the Medford Sand and Gravel Co., Medford, Ore., and has become the plant manager.

Richard W. Smith has been appointed assistant state geologist of Georgia and will start his work about July 1. Mr. Smith was formerly assistant state geologist for Tennessee and has written several articles on the Tennessee phosphate operations for Rock Products.

F. A. Jones, manager of the cement and limestone products division of the Pittsburgh Plate Glass Co., has resigned, to take effect June 1. Mr. Jones came to the company from the Kelley Island Lime and Transport Co. in 1919, and designed and erected a 3000-ton plant at Zanesville to crush limestone for the Columbia Chemical Co.'s plant, which is a subsidiary of the Pittsburg Plate Glass Co. It was at his instance that the company built the portland cement plant, in 1924, producing the Columbia brand of cement, the raw material being largely screenings from the crushing plant. The plant has been enlarged under Mr. Jones' direction and it is expected that it will be producing 5000 bbl. daily in November.

Walter Eversbach, superintendent of the United States Gypsum Co.'s plant at Gypsum, Ohio, has been transferred to the company headquarters at Chicago and has been succeeded by J. R. Davis, for the past 3 years superintendent of the Genoa, Ohio, plant.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

De Laval Pumps. Illustrated booklet on pumping equipment for irrigation purposes. Includes data on selection of pumps for particular requirements and methods of calculating pump friction, speed and etc. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Brown Pyrometers. Catalog No. 15, describing and illustrating complete line of Brown pyrometers, single, duplex and multiple type of recorders, automatic signaling pyrometer and accessories such as thermocouples, protecting tubes, switches, etc., 8 pp. 8x10½ in. BROWN INSTRUMENT CO., Philadelphia, Penn.

Portable Conveyors. Catalog No. 5 describing and illustrating types and uses of Brown portable loaders or pilers. Details of construction and design and chart showing capacities, etc., 24 pp. 8x10½ in. STANDARD CONVEYOR CO., North St. Paul, Minn.

Rubber Goods for Chemical Industry. Complete catalog illustrating and describing rubber sundries for different purposes. Features "Armorite" for lining pipe and handling abrasive materials and as a wearing surface for launders, hoppers and other equipment in the sand and gravel industry. Describes and illustrates rubber lined pipe, valves, etc. B. F. GOODRICH RUBBER CO., Akron, Ohio.

Manufacturers

Timken Roller Bearing Co., Canton, Ohio, announces the following changes and promotions in their organization:

Fred G. Rumball, formerly manager of the Kansas City branch, has been promoted to the position of sales engineer, automotive division. Mr. Rumball will have his headquarters at Cleveland, with Edgeley W. Austin, assistant manager of sales. The position of branch manager at Kansas City will be filled by **J. M. Carey**, who has been promoted from the position of salesman under Mr. Rumball.

T. F. Rose, formerly assistant manager of the Chicago branch, has been appointed manager of the Cincinnati branch, and **H. C. Sauer**, manager of the Detroit branch. Mr. Sauer was formerly assistant branch manager at Cleveland.

The branch office located at 1033 Cathedral street, Baltimore, Md., has been closed. The service requirements of Timken customers in this territory will be supplied through the Richmond, Pittsburgh and Philadelphia branches.

Hall-Will, Inc., Erie, Penn., has purchased a plant at Erie, Penn., in which it will manufacture pipe threading machinery, such as portable power driven threaders.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., announces the appointment of J. McA. Duncan, for the past 14 years Pittsburgh district manager, to the position of assistant general sales manager. W. R. Marshall formerly branch manager of Buffalo has been selected to assume the position made vacant by Mr. Duncan's promotion.

Sullivan Machinery Co., Chicago, Ill., have moved their Knoxville, Tenn., office to new and larger quarters at room 611-15 General Bldg., 623 Market St.

Engineering Sales Corp., Cleveland, Ohio, has been formed by E. A. Smith, sales enginer of the Hill Clutch and Machine Foundry Co., for the past 10 years. Offices will be maintained in the Perry-Wayne Bldg., Cleveland. The company will act as contracting engineers and distributors of equipment used in rock products industries.

Where Quality in Aggregate Counts

IN cement concrete, the stone is surrounded by portland cement mortar and there is no abrasive action between the rock particles. Extreme wearing conditions might in time expose the rock in the surface of the pavement to direct wear, but the wear tests which have been made do not indicate that the wear of the concrete would necessarily be in proportion to the abrasive losses of rock in the Deval test. Some of the softer rocks have made excellent showings in the wear tests of concrete. Concrete in pavement and in structures is subjected to tensile and compressive stresses and it has been found by laboratory experiments, that the better quality of aggregate is reflected by increased strength in concrete.

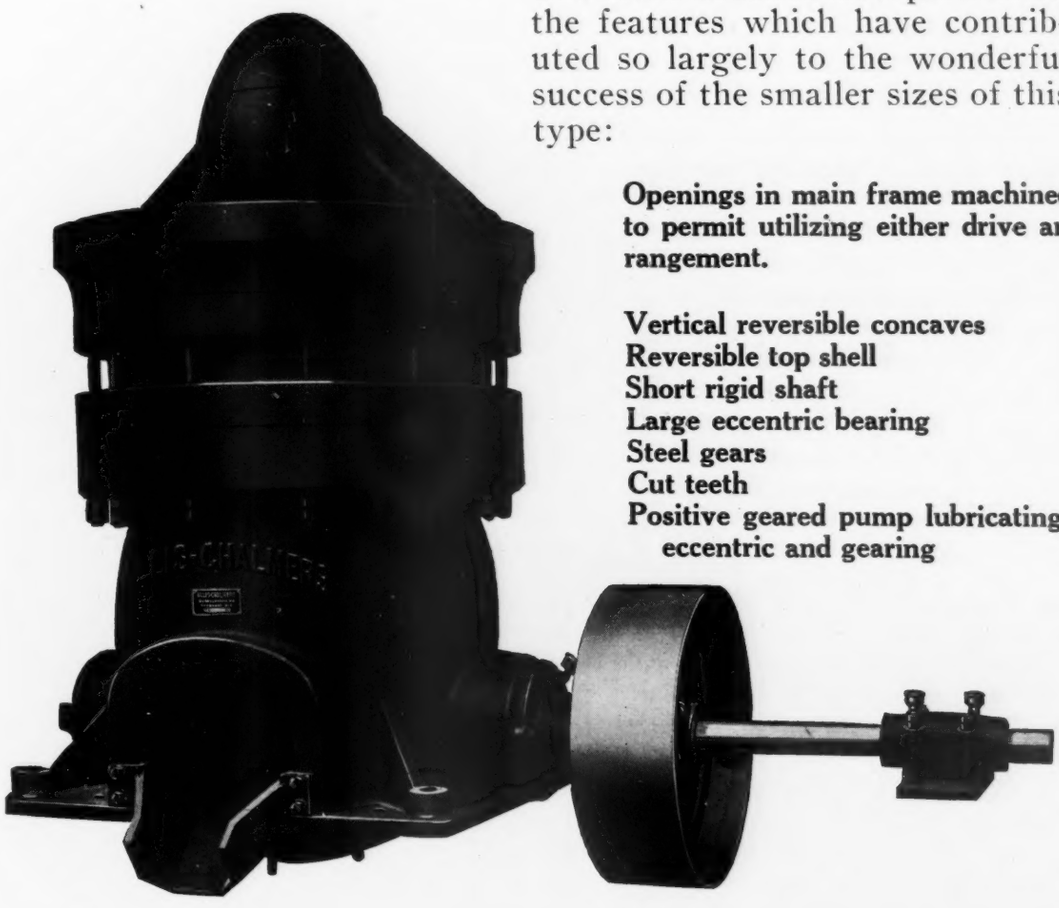
The effect on concrete strengths is quite appreciable when the mortar strength is high. Weak mortars do not develop the strength of the coarse aggregate. In concrete of 3000 lb., or more, compressive strength, the quality of the coarse aggregate is an important consideration. The Deval rattler and shot rattler tests indicate relative hardness and toughness of the material and are, therefore, applicable in securing a good quality of rock for use as coarse aggregate. For aggregate used in high strength concrete, the loss by the Deval test should probably not exceed 5%, and the loss by the shot rattler test should probably not exceed 25% on crushed rock.

The shot rattler loss should not exceed 18% or 20% on screened gravel. Coarse aggregate for concrete work should not show excessive gain in the absorption test, particularly where the concrete is to be water-tight for the protection of steel or resistance of alkalies. Rock which weathers rapidly and which shows excessively high losses in the wet test would not be desirable for use in unprotected concrete.—*California Highways.*

New 18-inch Superior McCully Fine Reduction Gyratory Crusher

The latest development in the Superior McCully Fine Reduction line, furnished to a large Cement Company--having two feed openings, each 18 in. by 68 in.--capable of taking the product from the largest size primary crushers --capacity with minimum discharge opening of 2 1-2 in.--225 to 275 tons per hour.

The 18-in Crusher incorporates all the features which have contributed so largely to the wonderful success of the smaller sizes of this type:



Openings in main frame machined to permit utilizing either drive arrangement.

Vertical reversible concaves
Reversible top shell
Short rigid shaft
Large eccentric bearing
Steel gears
Cut teeth
Positive geared pump lubricating eccentric and gearing

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Gold Dust from Our Waste Flume

Irrelevant and Amusing Stuff That Passes Our Editorial Desks

Rock Products for "My Lady's Toilette"

"THE great stone face" now appears daily on the modern flapper. Rouge is made from the dark stone (hematite) the young lady below holds in her left hand, and nose

Copyright by Underwood & Underwood

Talc and hematite for nose and lips

powder from the white one (talc) in her right hand. The same rock products are used on the sides of barns, as most of us know.

"I say, Bob," asked an acquaintance, "Why did the foreman sack you yesterday?"

"Well," was the reply, "a foreman is one who stands around and watches his gang work."

"I know; but what's that got to do with it?"

"Why, he got jealous of me! People thought I was the foreman."—*The Southwestern Bulletin.*

Moral: Don't Run

Clark Mandigo, Secretary of the Kansas-Missouri Contractors Association, a unit recently affiliated with the A. G. C., cuts loose with the following story in the organization's latest bulletin:

"When Tom Johnson, of Eagle Grove, Ia., and O. M. Gallefald, of Forest City, Ia., arrived in Lees Summit in a taxicab an hour or so before the sewer and waterworks letting, recently, in order to file their bids on this project, they were promptly arrested by the sheriff and returned to Kansas City for identification as bandits who had held up the cashier of the Pullman Co. in the Union Station in Kansas City. The cashier could not identify them and they were released, but only after bids were opened on the Lees Summit projects.

"Their general build and the color of their suits, the hurry with which they left the Union Station at Kansas City, and probably the general similarity between the looks of a contractor and a bandit was sufficient evidence for arresting them on their arrival at Lees Summit. As there were plenty of other representatives of the construction industry at the letting, their bids were not missed. Local newspapers found the incident of sufficient importance to give it a column of first page publicity."—*Members News-Letter,* Associated General Contractors.

Ignorance

A congressman's wife, waking him in the middle of the night, told him that there were robbers in the house.

"Impossible," said the congressman. "There may be robbers in the Senate, but not in the House."—*Florida Times-Union.*

The Song of the Steam Shovel

By Arnold Andrews

Chug-a, chug-a, chug, chug, chug!
I wish this ore was dug;
I'm down so deep,
And I get no sleep,
At my chains I always tug.

The little pigmies drive,
To urge me faster strive;
While black smoke rolls,
From the glowing coals,
In my flesh their steel spurs drive.

A hundred cars a shift,
Five thousand tons to lift;
They cry for more,
Though my joints are sore,
And they tell me to be swift.

The long ore trains are late,
And big black steamers wait;
For ore I dig,
In my pit so big,
While I grumble, growl and hate.

I am a slaving priest,
Of an ever-hungry beast;
There seems no end,
Of the ore I send,
To the steel mills in the East.

Great mills where white steel runs,
Makes automobiles, guns,
Engines and ships,
And the knife that drips,
(I like best to think of guns!)

Like a must mad elephant,
My song of hate I chant;
The red dust blows,
Where my dipper goes,
Gusts of white hot steam I pant.

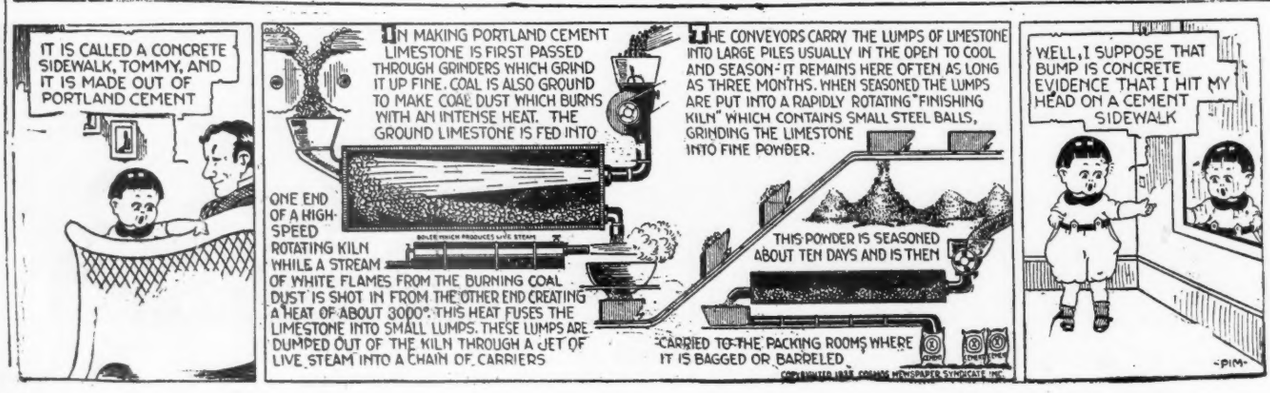
My red mouth yawns for coal,
I drink from the water hole;
My long boom swings,
While the popoff sings,
And my sixty steel feet roll.

All day I sing my song,
And chug chug all night long;
"Back up," I yell,
To the engine bell,
And it answers me, "Ding dong!"

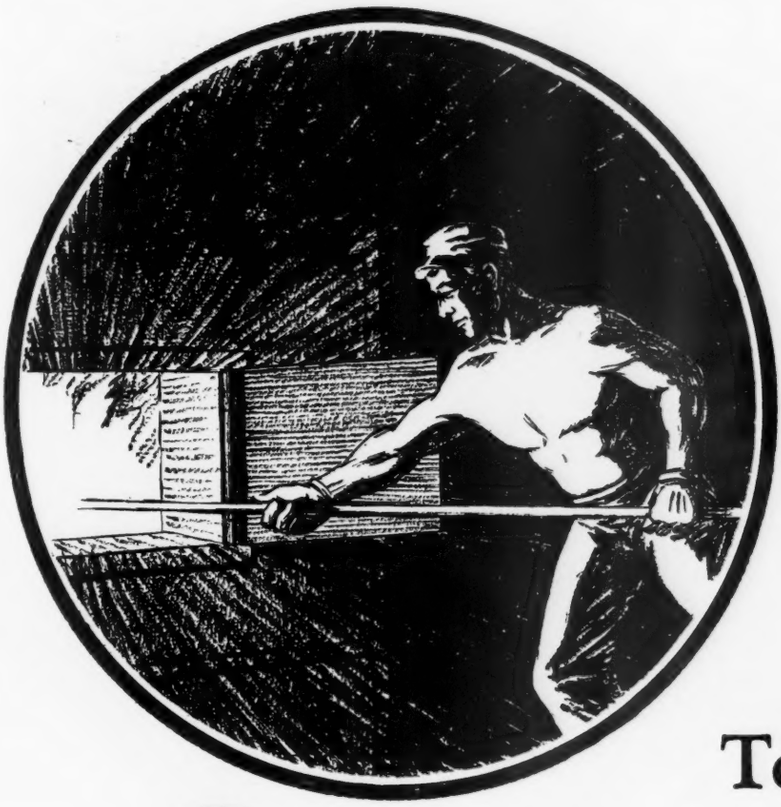
Chug-a, chug-a, chug, chug, chug!
I wish this ore was dug,
For then I'd rest,
In my deep earth nest,
Chug-a, chug-a, chug, chug, chug!

—*The Excavating Engineer.*

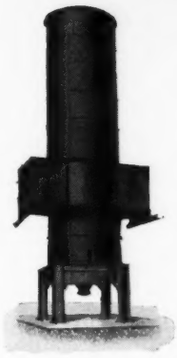
"TELLING TOMMY" **By PIM**

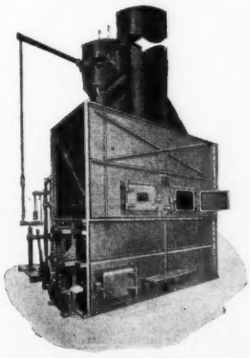

IT IS CALLED A CONCRETE SIDEWALK, TOMMY, AND IT IS MADE OUT OF PORTLAND CEMENT
IN MAKING PORTLAND CEMENT LIMESTONE IS FIRST PASSED THROUGH GRINDERS WHICH GRIND IT UP FINE. COAL IS ALSO GROUND TO MAKE COAL DUST WHICH BURNS WITH AN INTENSE HEAT. THE GROUND LIMESTONE IS FED INTO ONE END OF A HIGH-SPEED ROTATING KILN WHILE A STREAM OF WHITE FLAMES FROM THE BURNING COAL DUST IS SHOT IN FROM THE OTHER END CREATING A HEAT OF ABOUT 3000°. THIS HEAT FUSES THE LIMESTONE INTO SMALL LUMPS. THESE LUMPS ARE DUMPED OUT OF THE KILN THROUGH A JET OF LIVE STEAM INTO A CHAIN OF CARRIERS
THE CONVEYORS CARRY THE LUMPS OF LIMESTONE INTO LARGE PILES USUALLY IN THE OPEN TO COOL AND SEASON. IT REMAINS HERE OFTEN AS LONG AS THREE MONTHS. WHEN SEASONED THE LUMPS ARE PUT INTO A RAPIDLY ROTATING "FINISHING KILN" WHICH CONTAINS SMALL STEEL BALLS, GRINDING THE LIMESTONE INTO FINE POWDER.
THIS POWDER IS SEASONED ABOUT TEN DAYS AND IS THEN CARRIED TO THE PACKING ROOMS WHERE IT IS BAGGED OR BARRELED
WELL, I SUPPOSE THAT BUMP IS CONCRETE EVIDENCE THAT I HIT MY HEAD ON A CEMENT SIDEWALK
-PIM-

Portland cement manufacture explained in a newspaper strip (Cosmos Newspaper Syndicate)—"Roll your own" on this one



To reduce the cost of producing lime





On the score of operating economy alone, if on no other point, the "Arnold" Kiln and the "Weber" Hydrator would deserve the favorable consideration of lime producers anxious to improve the quality of their product—and reduce its cost. Each embodies the experience of engineers who know the lime industry like a book. Each has been constantly improved and refined as the result of our long contact with actual producing conditions in the field.

The "Arnold" Kiln. The "Weber" Hydrator. Two dependable means of attaining your goal: maximum production at minimum production cost.

ARNOLD & WEIGEL
WOODVILLE, OHIO, U.S.A.

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An Awakening in Non-Metallic Research

(An Editorial in "Engineering and Mining Journal-Press")

THE recently published partial report of Secretary Hoover's advisory committee for reorganization of the Bureau of Mines places unusual emphasis on the importance of technical study in the fields of the inorganic non-metallic minerals. No member of the committee represents any particular activity in the non-metallic field; the study was undertaken without undue weight of opinion in this direction. The recommendation that broad scope be given to this important field in Bureau of Mines activities provides considerable food for thought for mining engineers and research institutions.

A remarkably large share of the non-metallics enters the field of the construction industries, as readily appears when one calls to mind that the leading non-metallics are stone, sand, gravel, cement, lime, and gypsum. The structural industries, including not only the building trades proper, but also highway construction and public works, represent tremendous activities that are constantly being improved in engineering and technique. It is evident that research in the primary materials of construction should keep pace with progress made in their application, but such a condition is far from reaching an actuality.

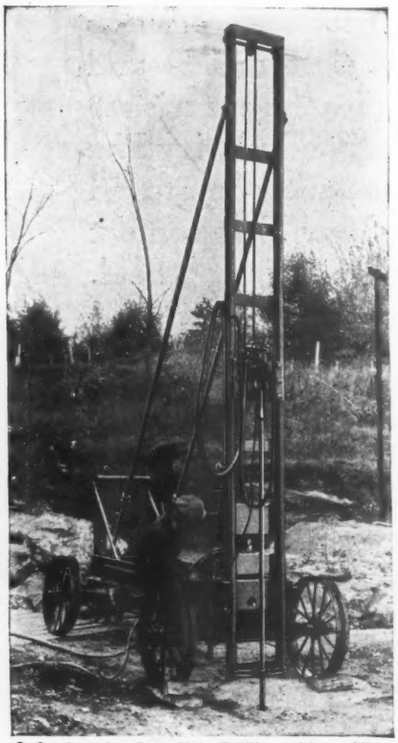
The most outstanding as well as one of the youngest of the non-metallic industries is portland cement, which has grown from nothing to an industry of $300,000,000 annual production in 50 years. With all due respect to the excellent work being accomplished through the Portland Cement Association and the Bureau of Standards, it is true, nevertheless, that the utilization of cement has far outstripped the basic study on properties and processes of manufacture; the fundamental research so far conducted on this complex material is scarcely a drop in the bucket when compared with the years of study devoted to iron and steel in hundreds of localities at home and abroad. Others of the non-metallics, notably the stone industries, are old in use, but new in the field of research. Slate has been used for roofing in Europe for many centuries, and in America for upward of a hundred years, but, strange as it may seem, it is not yet fully decided just what slate is; the American Society for Testing Materials is now struggling with a definition that will apply equally well to all commercial slates.

There are evidences all about us that the non-metallics are entering a new era, a period of technical progress, of basic research. Some of these evidences may be enumerated: The establishment of an Engineering Bureau of the National Crushed Stone Association; numerous research fellowships such as those of the National Lime Association and Gypsum Industries; cement studies by the Bureau of Standards and Lewis Institute; co-operation of the Marble Dealers Association with the Bureau of Standards in working out methods of preservation and treatment of marble; co-operation of the National Research Council with the Foundrymen's Association for a study of molding sands; the formation of a subcommittee on slate of the American Society for Testing Materials to formulate standards, tests, and a proper classification of slates; and the establishment of a Non-metallic Experiment Station of the Bureau of Mines to deal exclusively with problems arising in this broad field. With this array of activities and agencies together with many others not specifically mentioned, one may confidently expect an increasing knowledge of the fundamentals, a knowledge that must inevitably result in improved conditions in all branches of construction—and construction touches every community, every home, and practically every human activity.

Sand Rates to Chicago District Found Reasonable

THE Interstate Commerce Commission, by division 3, has dismissed No. 16429, John N. Bos Sand Co. et al. vs. Atchison, Topeka and Santa Fe et al., mimeographed, on a finding that the rate on sand, from Michigan City, Ind., to points on connecting lines in the Chicago switching district, are not unreasonable, unduly prejudicial or otherwise unlawful.

"DW-64," a great Sullivan Drill



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